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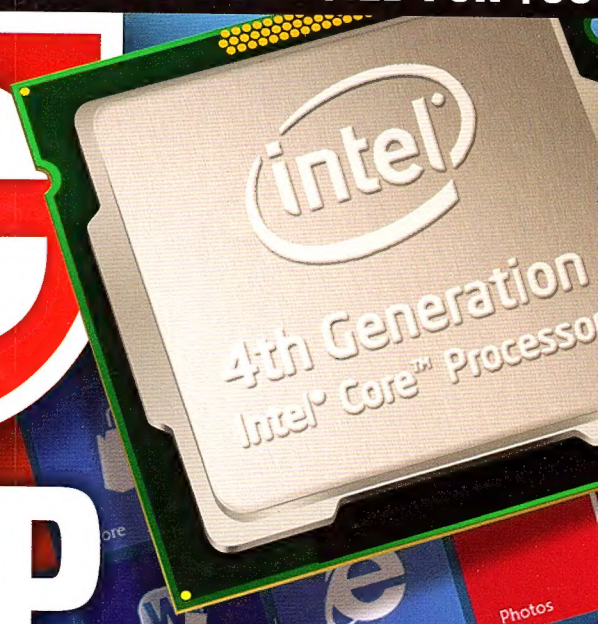

KILLER CHIP FOR WINDOWS 8.1

NTEL'S NEW HASWELL CHIPS ETHINK THE TABLET, LAPTOP AND DESKTOP FOR THE NEXT WAVE OF WINDOWS

ROAD TEST

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We test Microsoft's tablet in a bunch of PC scenarios

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Where are we headed?
Where is everyone??
the plan?
Have we decided yet?
I give up, let's postpone this.
Can everyone please RSVP?
Hey, I'm only free on Friday
I give up, let's postpone this.
Is Tuesday lunch good for you?
Where are we meeting?
When do we meet up?
Need to make a choice.

03 editorial

TONY SARNO

apc

Windows Blue, thank goodness

As we mention on the letters pages, we've never come across a more polarising operating system than Windows 8. People either hate it or love it, and several months after its release the divisions show no sign of easing. But you know what? It's all academic. Possibly prompted by user feedback and disappointing laptop and PC sales since Windows 8 launched, Microsoft is readying an upgrade nicknamed Windows Blue (or Windows 8.1), which addresses some of the annoyances that have caused the rift over Windows 8. The upgrade is likely to include a Windows 7-like 'Start' button and offer users the option of booting directly into the desktop, thereby giving those who want the traditional desktop experience the ability to mostly ignore the Modern UI, or as Microsoft calls it, the Windows 8 Menu.

This is wonderful news because Windows 8 is actually a very good operating system, superior to Windows 7 performance-wise, both in in speed, but also in the way it handles a variety of hardware, most notably SSD drives. But in forcing users to the Modern UI, which is clearly made for touchscreens and isn't an elegant solution for people using traditional desktops and big displays, it has alienated a humongous number of buyers and no doubt partly depressed the sales of not just the OS, but the hardware it runs on.

However, with Windows 8.1, Microsoft can remove the irritations and finally give the new Windows the audience it deserves, on millions more PCs that will benefit from having a leaner and meaner OS. That's when those who've resisted Windows 8 may finally appreciate it for what it is: a brilliant OS that also incorporates a vision of the future, giving users consistent and advanced functionality across a pantheon of digital devices ranging from PCs and laptops to tablets and even phones.

There's more, though. Intel is about to release its fourth generation of Core family processors, nicknamed Haswell. Intel has designed these chips with Windows 8.1 in mind, ensuring they're a perfect match for all the devices on which Windows 8.1 will be running. They'll deliver much longer battery life on ultrabooks and tablets, improve power and graphics capability across all devices, and even make better overclocking possible for desktop versions of the CPU.

In fact, I'm really excited about what's in store for all those PC users who stayed away from the new OS. Looks like we're finally getting a Windows without the pigheaded interface stupidities that plagued Windows 8, and hardware that's optimised to work with what's effectively a brilliant and (right now) less than widely appreciated operating system. And for those who have also accepted that tablets and smartphones are an important part of our daily computing, Windows 8 gives them a consistent experience across them all.

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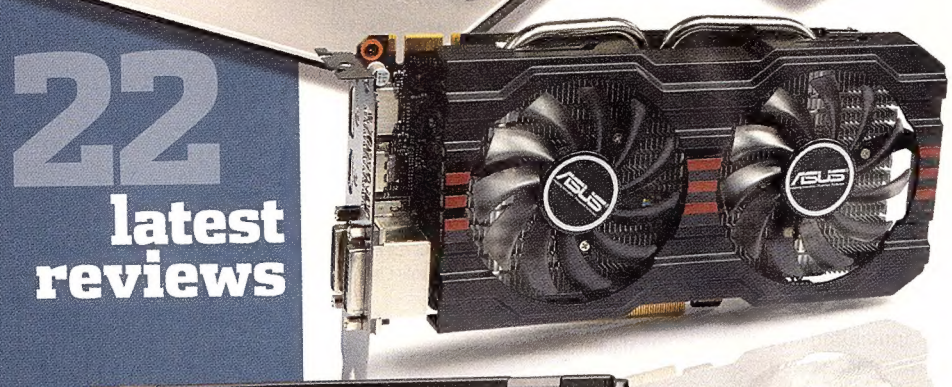

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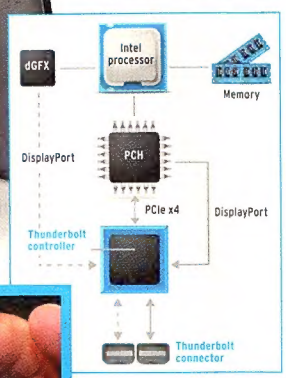

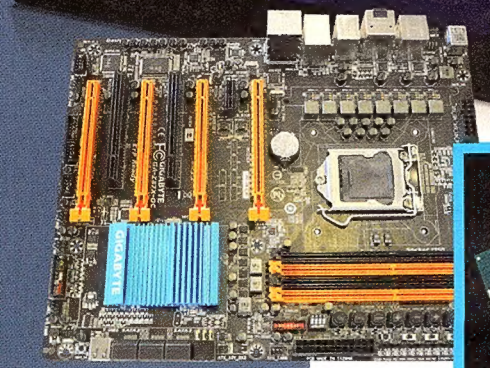

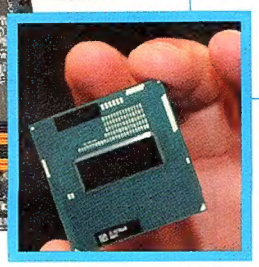

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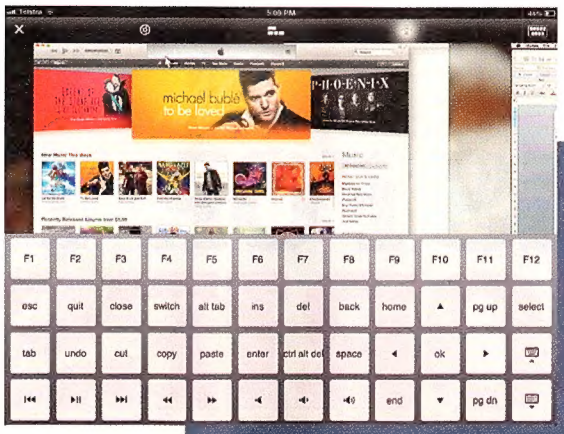
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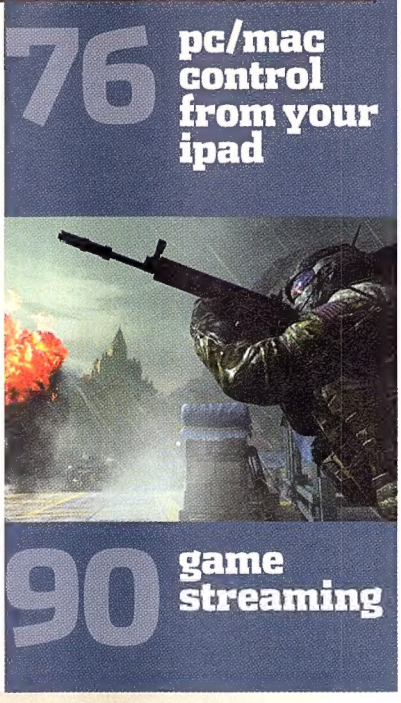

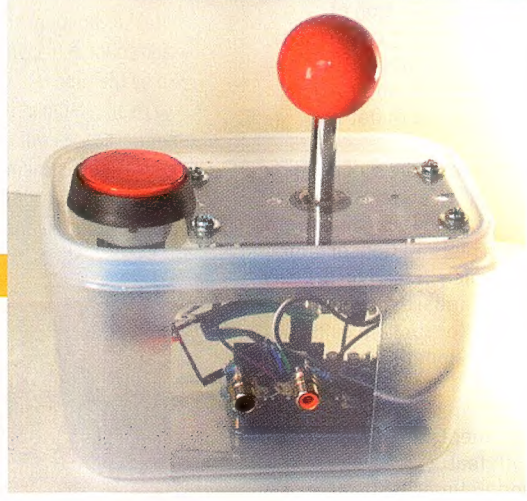

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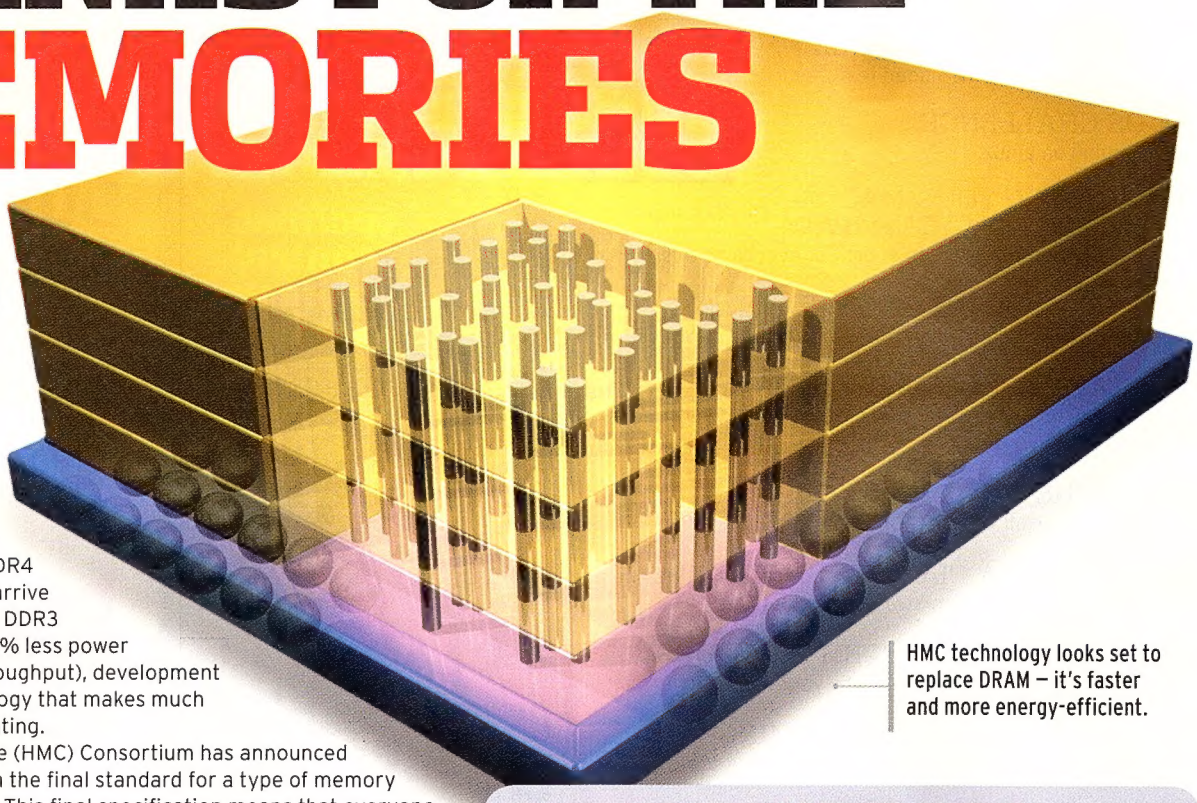
MEMORY

THANKS FOR THE MEMORIES

DDR4 may be left at the starting blocks by massively faster Hybrid Memory Cube technology.



HMC technology looks set to replace DRAM – it's faster and more energy-efficient.

As we wait for the DDR4 DRAM modules to arrive and start replacing DDR3 (DDR4 uses up to 4% less power while having double the throughput), development of another memory technology that makes much bigger leaps is also accelerating.

The Hybrid Memory Cube (HMC) Consortium has announced it has reached consensus on the final standard for a type of memory that's likely to usurp DRAM. This final specification means that everyone has the same starting point from which to begin developing HMC technology into any future products.

This new kind of memory is being built from a combination of high-speed logic and modern DRAM technologies. The logic layer sits at the bottom of DRAM stacks, which are connected by bonds that pass directly through the silicon, linking each layer to one another. This creates a far more efficient memory stack in terms of both bandwidth performance and energy efficiency.

"This milestone marks the tearing down of the memory wall," claims Micron's vice president for DRAM marketing, Robert Feurle. Micron has been collaborating with fellow memory giant Samsung to push forward this new advance in technology in a short time. The HMC Consortium has only been working together for 17 months, which in tech terms isn't a particularly long time to get a cross-company standard finalised.

So how does this compare to DDR4? The HMC Consortium calls the move to HMC revolutionary compared to the evolutionary move to DDR4. It believes memory needs to make revolutionary progress to meet the demands of high-performance computing (HPC), which is demanding both higher bandwidth and lower power requirements. It's tough for DRAM to keep pushing forward in terms of both features.

A single HMC module is touted to be around 15 times faster than a standard DDR3 module, while also demanding around 70% less energy per bit compared to the existing DRAM technology. And with modern devices being ever more focused on mobility and size, while still needing even greater performance and battery life, HMC is being seen as just as important for consumer technology as HPC. Because HMC modules are set to use almost 90% less space than existing DIMMs, it can only be a good thing for mobile devices, too.

THUNDERBOLT UPDATES TO 20GBPS

Intel has announced it's to update the Thunderbolt technology with bidirectional transfer rates boosted from 10Gbps up to 20Gbps next year. So by the time Haswell has passed into the realm of boring old tech – and we're all talking about the move to 14nm production nodes – high-end motherboards will sport Thunderbolt 2.0 ports that nobody will bother to use. It does seem like a bit of a reaction to the proposed update to USB 3.0 allowing for 10Gbps transfers, and Thunderbolt is still going to need more popular support if it's ever to take on the might of USB.

END OF BOXED SOFTWARE IS NIGH

In March, Adobe announced it would be phasing out boxed copies of its Creative Suite and Acrobat products. The Suite customarily includes Photoshop, Premiere, Illustrator and InDesign (though there are several variants for different budgets). As before, you can still buy downloadable versions from www.adobe.com.au or authorised third parties. There's also Creative Cloud, Adobe's subscription-based service. Launched in May 2012, it grants access to Adobe's entire range of products for $49.99 a month if you make a one-year commitment, or you can pay $74.99 for month-to-month access. You can subscribe to individual programs for $19.99 a month.

GRAPHICS CARD

FIT FOR A (GAMING) GOD?

ASUS's gargantuan ARES II graphics card will set you back around $2,000 and comes with its own water cooler. But can a graphics card possibly justify that price? Bennett Ring finds out.

Two grand is more than enough cash to buy a powerful gaming PC, four iPads, a cheap car or a return flight to London. Or, if you've got bags of the stuff stashed under your floorboards and don't know how to spend it, the new ARES II graphics card from ASUS is a good option. Yep, $2,000 for a single video card and it doesn't even come with an IT technician living under your desk providing 24/7 support and back massages.

What it does come with is twin Radeon HD 7970 GHz-edition GPUs. These chips recently pole-vaulted Nvidia's GTX 680 to become the fastest sub-$1,000 graphics processors in the world, taking the lead after AMD's driver wizards figured out how to extract even more grunt out of them, a year after launch. Nvidia's GeForce Titan owns the overall single-GPU crown, but at $1,600 for a single card it's more of a workstation option than one pitched at gamers.

Just one of those HD 7970 GPUs is enough to beat today's biggest PC games into a bloody pulp, so you can imagine the damage two of them can do. If you're rich enough to own a 2,560 x 1,440 display or triple monitors – and let's face it, if you're considering a $2,000 graphics card you probably have an iMAX display in your gaming den – the ARES II is one of the few graphics cards with the power to run at these ultra-detailed resolutions.

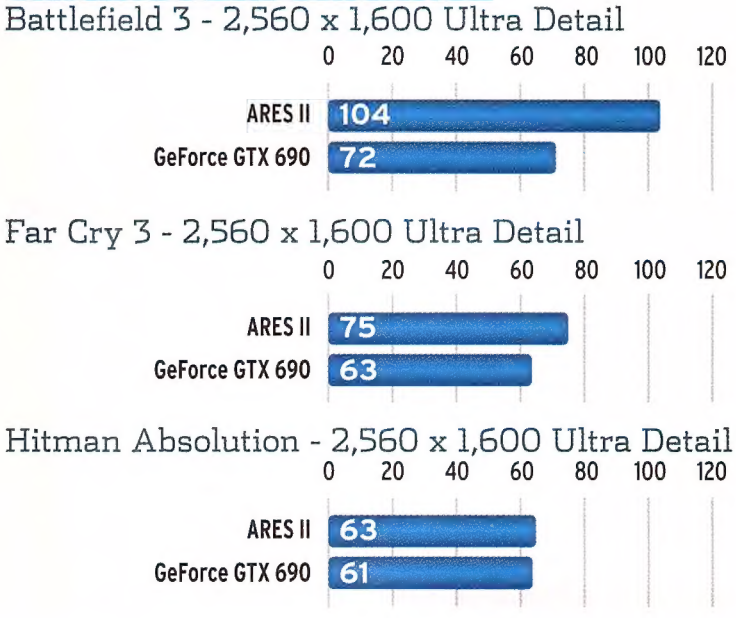
AMD's Radeon HD 7970 GHz editions double as handy room-warmers in the colder months, so whacking two of them on a single card sounds like a fantastic recipe for a house fire. However, ASUS has calmed these heat demons with a clever cooling system; it mixes both traditional air cooling with a custom-built water cooler, yet it's small enough to fit inside a standard PC case. Opening up the aluminium suitcase that the ARES II arrives in, which looks like it should be filled with diamonds, we were pleasantly surprised at the dainty dimensions of the external radiator, which is about the same size as a thin Rubik's cube. It's a hell of a lot easier to use, though, with a simple mounting system. To the delight of our delicate ear drums, fan noise with the ARES II under load was very hard to hear (at least over the noise of us shooting people in *Battlefield 3*). Nice work, ASUS.

Just in case twin Radeon HD 7970 GHz GPUs isn't impressive enough for you, ASUS has also equipped this card with 6GB of expensive GDDR5 memory. That's basically enough memory to control the Mars rover and makes this one of the best slabs of silicon around for crazy high resolutions such as 4K and beyond.

We ran a few tests to see what the ARES II could do and luckily didn't have any police bashing down the door looking for hydroponic farms as a result of the ARES II's roaring appetite for energy. As expected, performance was simply insane, albeit not quite insane enough to justify the even crazier price tag.

ASUS has only built 1,000 of these cards, figuring that there's probably only that many people on the planet stupid enough to spend so much money on a graphics card that can be beat by twin $500 cards. Still, it's a remarkable engineering achievement and will appeal to the same kind of crowd who commute in a Bugatti Zonda: rich tossers. And we're not just saying that because we're jealous of them. OK, maybe we are a little bit. atc

GAMING PERFORMANCE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THE (A)PC REVOLUTION
JULY/1997

OZ MUSIC SHUNS ONLINE

The world's five dominant record companies – BMG, Polygram, Sony, EMI and Warner – have begun trialling online sales and delivery of music in France, but lack of interest by their Australian subsidiaries threatens to leave Australia's recording industry and artists high and dry.

The trial utilises delivery software developed by Paris-based EuroDat and incorporates payment software developed by another European company called Kleline. 400 houses surrounding Paris are taking part in the trial, connected via cable operator Lyonnaise des Eaux.

If the trial is a success, it could be expanded beyond cable, using the internet as a medium to deliver music. The system works by allowing customers to download music from a central site to their hard drives, with EuroDat software maintaining copyright and payment control by monitoring the number of generational copies made and the number of times the music is played back.

SD CARD

Transcend Wi-Fi SD Card

This looks and functions like a standard SD card and comes in 16GB ($79.99) and 32GB ($119.99), but it's a bit more than just a storage device for photos. It comes with built-in Wi-Fi, which lets you link your smartphone, tablet or PC wirelessly when the card is plugged into a camera. You connect to it as if it was a standard wireless network and then launch the iOS or Android app to view your photos and videos on your phone or tablet. You can use the app to zoom in and rotate photos, and you can download them straight to the device you're viewing them on. If you fill up the whole 32GB with photos then this is going to be a time-consuming process, but the ability to view and save a couple of recent snaps without having a PC is very useful. If you select the 'Shoot and view' option, any new photos you take on your camera will be displayed instantly on your device. If you don't have a device that supports the app, you can still see your files by opening a web browser and typing in the IP address of the card (included in the quickstart guide). It won't be for everyone, but if you want to review photos from your digital camera straight after you've taken them, you'll love it.

TABLET

Toughpad

Already in use by Australian surf lifesavers, Panasonic's Toughpad FZ-G1 is a tablet that can survive sand, dust and water, not to mention being dropped onto the ground from a height of 1.2m. The tablet features a 10.1in 1,920 x 1,200 display made for viewing in bright sunlight, Intel Core i5 processor and optional 3G, in addition to Wi-Fi and Bluetooth. With a user-replaceable battery, the device weighs in at 1.1kg. At around $3,500, though, you'd really want to mistreat it to justify the cost.

USB KEY

Toughkey

Concerned that your USB key isn't as tough as your Toughpad? Get a LaCie XtremKey, which is just as resilient and nearly as expensive at $89 for a 32GB version (or $139 for 64GB). The key is water-resistant up to 200m, can survive 10m drops and can withstand being crushed by up to 10 tonnes of pressure. It can also tolerate temperatures as high as 200°C and as low as -30°C, thanks to its sleek metal alloy body. Although we didn't have the resources to really put the LaCie XtremKey through its paces (ie. wheels of a mining truck), it certainly feels like a solidly built device that you could safely store your files on. Read and write speeds are good, with 203.18MB/s sequential read speeds and 85.82MB/s sequential writes. apc

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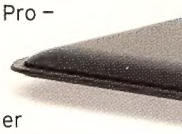
FEATURE

IS YOUR NEXT PC A TABLET?

Alex Castle tests Microsoft's Surface Pro workhorse tablet in several common desktop uses to see how it stacks up to a traditional PC.

For the last three years, there have been questions about what the spectacular rise of the iPad and other tablet computers means for the traditional desktop PC. Are tablet sales cannibalising PC sales (the 'post-PC' worldview) or is this simply a new category that people are buying alongside traditional computers? Will the tablet remain a third device, between a smartphone and a PC, or will it gradually take over the role that's currently played by laptop and desktop computers? With the release of the Surface Pro, Microsoft isn't making these questions any easier to answer.

The Surface Pro looks like a tablet, but using one feels suspiciously like using a laptop. Up until now, tablets have been characterised by their inability to run powerful desktop software like Photoshop and Microsoft Office, but that distinction is gone on the Surface Pro – a tablet that can run any Windows software. A tablet and also a general-purpose computer, the Surface Pro is blurring all the lines.



Are devices like the Surface Pro eventually going to render the PC obsolete? We decided to find out by using one to do every kind of computing task we could think of, from surfing the web to designing a web site. We broke down our findings by the different kinds of PC users that are out there, so find the page that describes you and discover if your next PC could be a tablet.

PASS CASUAL USER

Just the basics.

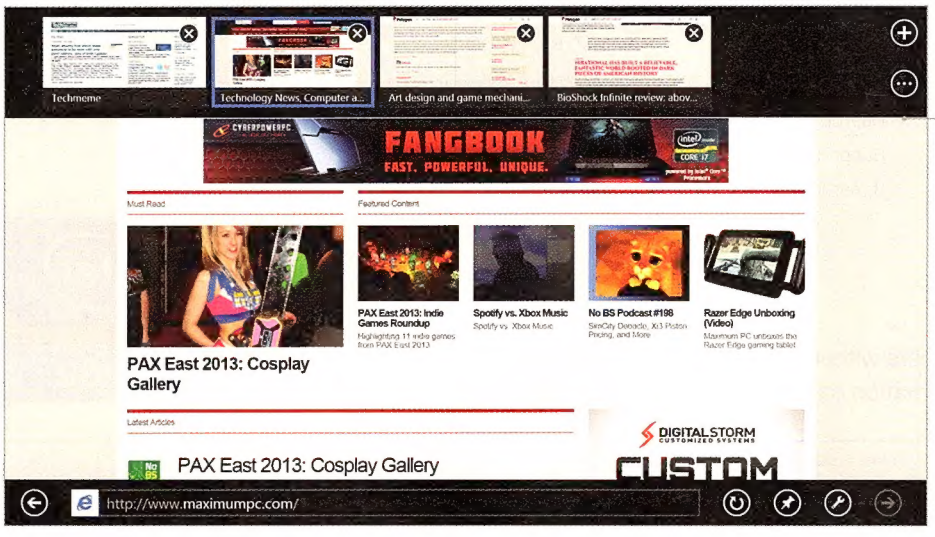
First off, we're going to look at what we consider the baseline for a casual PC user. These are the functions that any tablet, laptop or desktop computer needs to be able to perform, and flawlessly. Because of this, we're going to be a little stricter with these programs in the screen and input categories – if we have to plug in a mouse to check our email, something's gone woefully wrong.

WEB BROWSING

Fortunately, the Surface Pro starts out our casual test on the right note – browsing the web on the Surface is a great experience. Internet Explorer 10 on the Modern UI comes with a sharp custom interface that makes it easy to surf, search and switch tabs using only the Surface's touchscreen. When the Type Cover isn't plugged in, the virtual keyboard pops up whenever you need it. When you're not using the address bar or tab switcher, they slide out of the way, letting the site take up all of the Surface's screen space.

Surfing in desktop mode is less thrilling. Even with the default 150% magnification, interface elements are a little difficult to hit reliably using the touchscreen and to get the virtual keyboard on the screen you have to hit a small icon in the system tray and manually close it (again, with a too-small button) to get it out of your way when you're done. All this makes trying to use the desktop version of IE with touch a huge pain – we recommend sticking with the Modern UI version.

There's just one problem with that, though. While the latest version of



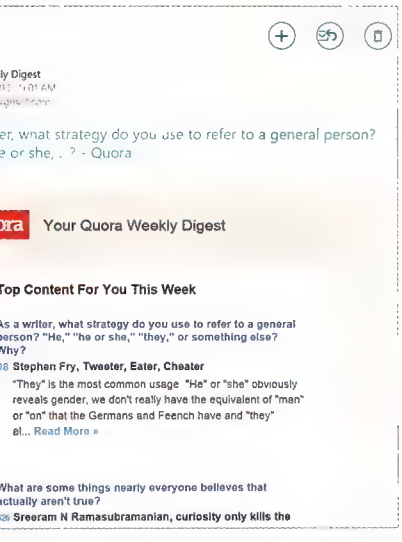
The tablet version of IE10 is much more touch-friendly than the desktop version.

Microsoft's email app looks nice, but has a small fraction of the power of Outlook.

IE is actually very fast and quite nice to use, we still prefer Chrome a bit more. Unfortunately, if you set any browser other than IE to be your default browser in the desktop mode, you can't use the tablet-optimised version of IE, crippling the Surface's ability to surf the web on the go. Pretty scummy.

EMAIL & MESSAGING

The state of messaging on the Surface Pro is a little more disappointing. The built-in email app looks nice, but feels a little half-baked. Threaded message navigation is a bit difficult and there's no way to search through messages that haven't been loaded onto your device. It does the job fine, but you'll probably find that you like using a Gmail or Hotmail account in the tablet-optimised browser better. If you're using a non-webmail account and want greater-than-webmail functionality, your only choice is Outlook, which works just fine and is even reasonably touch-friendly on the Surface.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er, what strategy do you use to refer to a general person?
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Top Content For You This Week
As a writer, what strategy do you use to refer to a general person? "He," "he or she," "they," or something else? Why?
Stephen Fry, Tweeter, Eater, Cheater
"They" is the most common usage "He" or "she" obviously reveals gender, we don't really have the equivalent of "man" or "on" that the Germans and Feench have and "they" el... Read More »
What are some things nearly everyone believes that actually aren't true?
Sreeram N Ramasubramanian, curiosity only kills the

If you're still on the IM bandwagon, you'll be pleased to know that the Surface Pro has a great messaging client in the form of IM+, available in free and paid versions on the Windows Store. The desktop Digsby and Pidgin apps also work, though once again you might find yourself struggling to use their interfaces with the touchscreen.

MEDIA

As a platform for consuming media, the Surface Pro is as good as it gets. The built-in Xbox media apps are pretty bogus, but of course, you're free to download iTunes or VLC or any other media players or managers that run on Windows. Video content looks absolutely gorgeous on the 1080p screen and unlike with the iPad's crazy Retina display, you can actually find plenty of content that takes full advantage of it.

WHAT'S THE VERDICT?

The Surface Pro's got more than enough power for any casual computing needs and as long as you stick to tablet-optimised apps, the experience is excellent. Still, if this is all you're doing, a cheaper, lighter tablet might be better suited to you.

PASS OFFICE USER

You never have to leave the office behind.

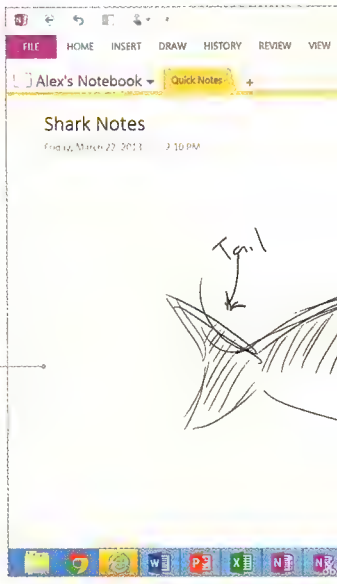
Now we'll start to get into what sets the Surface Pro apart from other tablets. While others offer some minor league productivity software, none of them give you access to the full ecosystem of Windows office applications. This is where we expect the Surface to shine.

MICROSOFT OFFICE

We'll start with the cornerstone of the Windows productivity world: Microsoft Office. Although it's not fully integrated with the tablet interface, Microsoft has clearly spent some effort getting the programs ready for tablet use, with a number of touch-centric features.

The redesigned Ribbon, with its flat aesthetic, is well-suited for touch use. The menu buttons are spaced far enough apart and the programs can tell when you press one with your finger rather than a mouse. When you do, a separate version of the Ribbon is displayed, which is slightly

OneNote's never been as useful as it is on the Surface.



Neither the tablet version of Evernote (pictured) nor the desktop version is a perfect fit for the Surface Pro.

larger and spaces the buttons farther apart for easier touch. The applications also allow you to swipe to pan around your documents and feature pinch-to-zoom. All the gesture recognition is highly responsive and smooth.

Additionally, all the software works with the stylus. Simply bring the stylus anywhere near the screen and a previously hidden 'Pen' menu appears, which allows you to draw or highlight anywhere on your document. This feature works essentially identically across Word, Excel, and PowerPoint – your scribblings occupy a layer of their own, unrelated to whatever document is beneath them, but it's pretty handy for making quick notes on a shared document.

OneNote has always been a black sheep in the Office family, but the note-taking application really comes into its own on the Surface Pro. The stylus is great for drawing quick diagrams or taking handwritten notes, and the program's infinitely scrolling notepad conceit is greatly enhanced by the ability to pan and zoom with your fingers. While Evernote has long been our note-taking application of choice, OneNote really seems like the better pick on the Surface Pro.

The Office UIs look perfectly crisp under the standard 150% magnification and respond well when the screen changes orientations. A lot of programs end up improperly maximised when you switch from landscape to portrait mode and back, but Office works great – handy when you want to type a document using the Type Cover, then detach it and do some quick editing with the stylus.

Performance-wise, Office gets a pass. We opened large documents in Word, Excel and PowerPoint at the same time, without putting a dent in the Surface Pro's performance.

OTHER APPLICATIONS

File syncing apps are no problem, of course – the Surface Pro comes with some free SkyDrive space, but we didn't have any issues using Dropbox, SugarSync, and Google Drive. The Pro's limited hard drive space (just under 90GB is usable on the 128GB model) means packrats will have to think twice about syncing their whole Dropbox.

There are two ways to use Evernote on the Surface Pro. There's a tablet version of the program in the Windows Store, which is pretty watered-down in terms of features, but it has a nice interface and there's the normal desktop client. The desktop client's interface is a little hard to use without a mouse or the stylus, but the 'Ink Notes' feature works very well for pressure-sensitive sketching.

WHAT'S THE VERDICT?

If you're looking for a tablet that can give you access to high-quality productivity tools, the Surface Pro is probably the best choice for you. Other tablets like the iPad offer some decent document-creating power, but they can't compete with the feature set of the real deal Office suite.

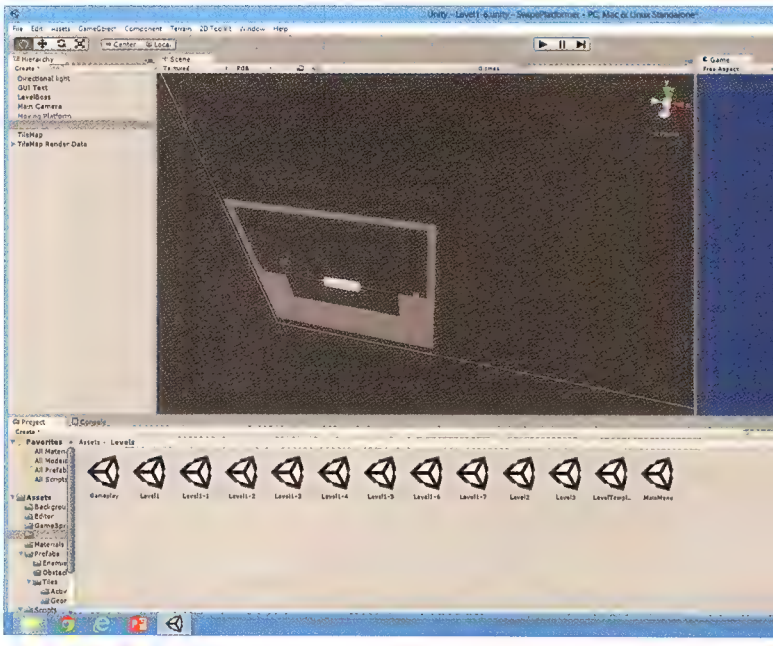
PASS DEVELOPER

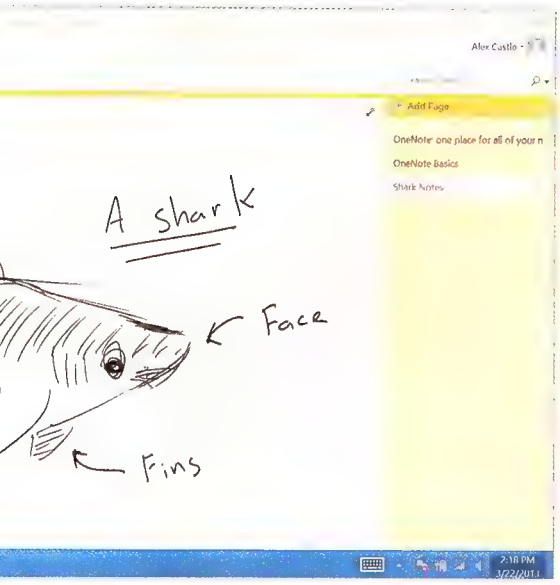
Coders have a lot to love about the Surface Pro.

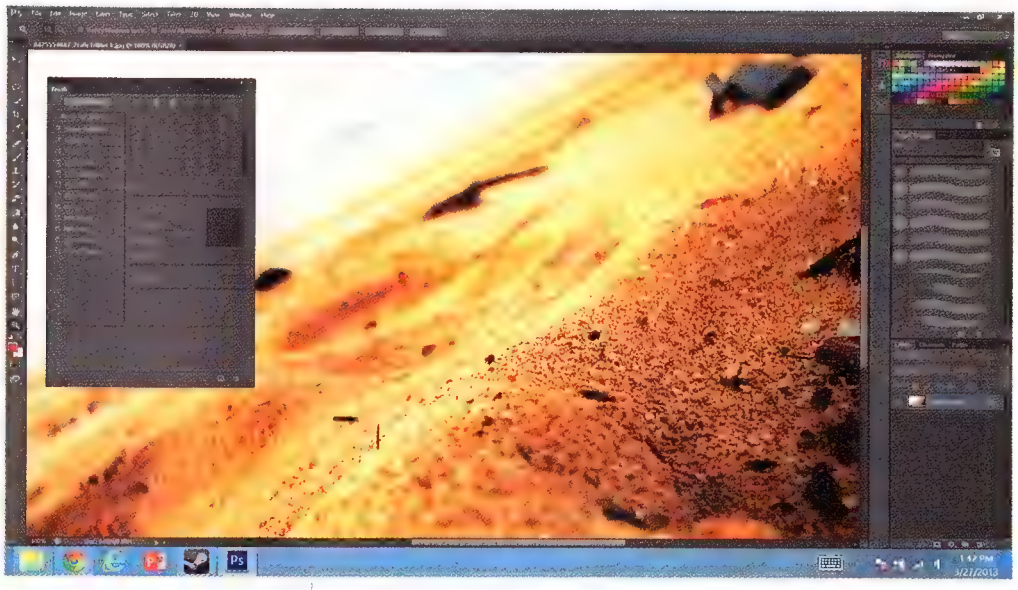
One of Microsoft's most loyal contingencies has always been developers. That hasn't stopped them from writing programs for other platforms (see the underpopulated Windows Store for evidence of that), but Windows has always been the platform with the best tools for software creation. We decided to try out Visual Studio on the Surface Pro, along with the popular game design engine Unity 3D.

VISUAL STUDIO

Microsoft's Visual Studio is an incredibly sophisticated integrated development environment (IDE) with a robust feature set. If any IDE is going to give the Surface performance trouble, it would be Visual Studio. In our testing, the Surface Pro is more than up to the challenge. Admittedly, that wasn't a huge surprise for us – plenty of people code on laptops with worse specs than the Surface Pro. The real question is whether the form factor works well for development.







Photoshop's miniscule buttons are hard to hit, even with the stylus.

Only a masochist would try to write code with an onscreen keyboard, so the Type Cover is a must for would-be Surface developers. Even then, the Surface Pro isn't quite ideal – the touch keyboard's trackpad occasionally picks up your thumbs when you don't want it to and deposits the cursor at some arbitrary point in your code. With a Bluetooth keyboard, we had no problems with the Surface Pro and had a great time coding with it.

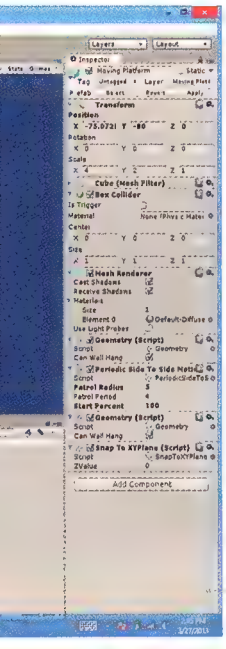
UNITY 3D

The Unity game engine has contributed to the recent boom in indie game development, with a capable, efficient development environment and a student-friendly pricing structure. Does it play nice with the Surface Pro?

Sure it does! We had no difficulty opening and editing large game projects, installing editor add-ons, or test running games on the Surface Pro. The only drawback we found is that Unity isn't yet able to handle the Windows 8 touch events, so you can't code and test a game on the same machine – yet. The Unity team has promised support for Windows 8 touch in an upcoming version of the engine.

WHAT'S THE VERDICT?

The Surface Pro is an excellent machine for developers, but think about picking up a Bluetooth or USB keyboard.



Game development on a tablet is more than possible with Unity 3D and the Surface Pro.

MIXED ARTIST

Putting the stylus to the test.

Stylus input is hardly a new concept in computing, but since the iPhone, it's been out of favour in mobile devices. And while multitouch is great for basic navigation, for art, you might as well be finger painting. We decided to find out if the Surface lives up to its potential.

PHOTO EDITING

Photoshop is the flagship of Adobe's sprawling Creative Suite and probably the most widely used professional creative software in the world. It's also not exactly lightweight, as far as system requirements go, so we were excited to see how well it runs on the Surface Pro.

Quite well, as it turns out. Like most Adobe software, Photoshop doesn't rely heavily on the GPU and the Surface Pro's Core i5 CPU provided enough horsepower to handle whatever Photoshop threw at it. Even when opening huge RAW files and applying all the most intensive filters in CS6, we couldn't get the Surface Pro to so much as stutter. The system's 4GB of memory isn't exactly puny, but it would be very possible to use it up opening a bunch of large files at once.

So for photographers, the Surface Pro could be an invaluable piece of gear. No matter where you are, you can plug your camera into the Surface Pro's USB port, transfer some photos, tweak and edit them, and upload or save them until you get home. Plugged into an external monitor (at the tablet's native 1,920 x 1,080 resolution), you could even use the Surface Pro as a capable desktop workstation.

DIGITAL GRAPHICS

For digital painters and other graphic artists, it's a little more of a mixed bag. Photoshop performance is still fairly good, but brush lag started to show up with brush sizes larger than 25 pixels or so. Unfortunately, at the time of writing, most high-end digital painting software, including Photoshop and Corel Painter, didn't support the Surface Pro's pressure-sensitive stylus driver. You can still use the stylus as a mouse surrogate, but the eraser doesn't work, and pressure sensitivity – an important feature for natural-looking drawing – doesn't register.

Additionally, we encountered some persistent issues with line smoothness across multiple art programs. The problem wasn't present when we plugged a Wacom Intuos5 into the Surface, leading us to believe that it, too, is related to the driver problems. For its part, a Surface representative told us: "Microsoft is working with the necessary partners to make advanced features of the Surface pen available across a number of applications in the near future."

One of the main problems with running Photoshop on the Surface Pro (and this holds true for almost every program in this section) is that you lose access to time-saving keyboard shortcuts. Combined with too-small interfaces, your workflow can really be slowed down. Fortunately, enterprising users have ported a popular AutoHotkey script called ArtDock to the Surface Pro (available at **tinyurl.com/c4n47r2**), which adds a context-sensitive tray of touch-size icons that make it easy to access common hotkeys in any popular art software.

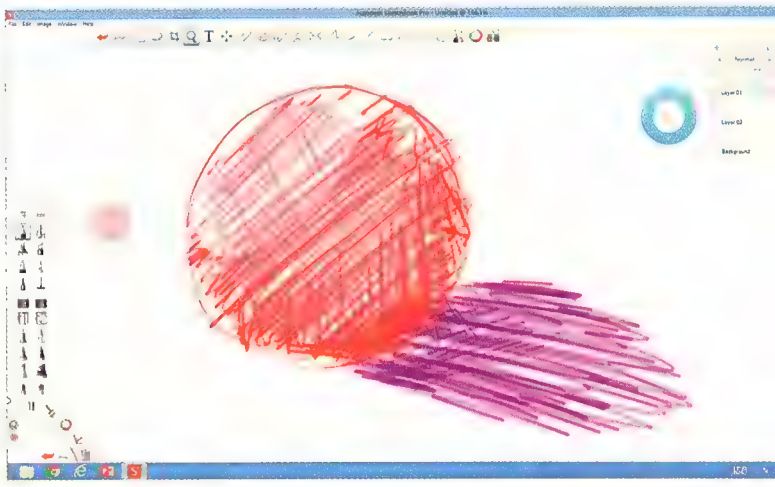
SKETCHBOOK PRO

While the software doesn't have the expansive feature set of more expensive art programs like Corel Painter, Autodesk's SketchBook Pro

takes much better advantage of the Surface Pro's hardware. It works perfectly with the Surface's pressure-sensitive stylus and all interface elements are designed to be accessible through nested radial menus, so you can quickly control the program without ever setting down the stylus. Our only beef with the program is that unlike the simpler app SketchBook, the Pro version doesn't respond to multitouch gestures, making it unnecessarily difficult to pan and zoom.

WHAT'S THE VERDICT?

For photographers, the Surface has a lot to offer. It's the only way you'll get good portable Photoshop performance in such a small form factor and the stylus lets you do some basic photo editing without so much as a desk or a chair. For digital artists, a Surface loaded with SketchBook Pro is a fun way to do some digital sketching wherever you are. However, for professional-quality work, you won't want to sell your Wacom just yet – at least not until Microsoft sorts out the stylus driver issues currently hindering the Surface Pro.



PASS DESIGN

Put away those MacBooks.

You might tend to associate the trendy graphic and web design crowd with Mac computers, but they have a lot to gain with the Surface Pro. Like art applications, design software works best with a stylus, but absolute, pixel-perfect fidelity isn't quite as crucial and elements can be easily adjusted after they're first placed. Here are our impressions after trying a large variety of design software on the Surface Pro.

ILLUSTRATOR & FLASH

Using Adobe's vector drawing application Illustrator on the Surface Pro is similar to using Photoshop in a lot of ways. The two programs have similarly laid out interfaces, with tightly packed trays of small buttons. With the stylus it's not too hard to select the tools you need, but the stylus's accuracy drops off as you near the edges and corners of the screen, making it quite hard to hit the menu bar at the top of the program.

Flash's interface is even more packed, with the important timeline requiring some extra-precise stylus work to use. We'd recommend a separate mouse for anyone doing animation work on the Surface Pro.

Like all the Adobe products, neither Illustrator nor Flash currently offer pressure sensitivity with the Surface Pro's stylus. Fortunately, for creative work, pen pressure is a lot less critical in vector-based programs than in Photoshop, as most linework is done with the control-point-driven Pen tool, rather than freehand.

We opened several very large Illustrator and Flash files, and neither ever showed any signs of slowing.

SKETCHUP

3D modelling is the sort of high-precision, involved work that isn't likely to migrate off the workstation and onto a tablet anytime soon. But SketchUp (formally owned by Google, now Trimble) offers a more design-centric take on 3D, letting you build up low-poly 3D models with minimal mousework – an excellent candidate for the Surface Pro.

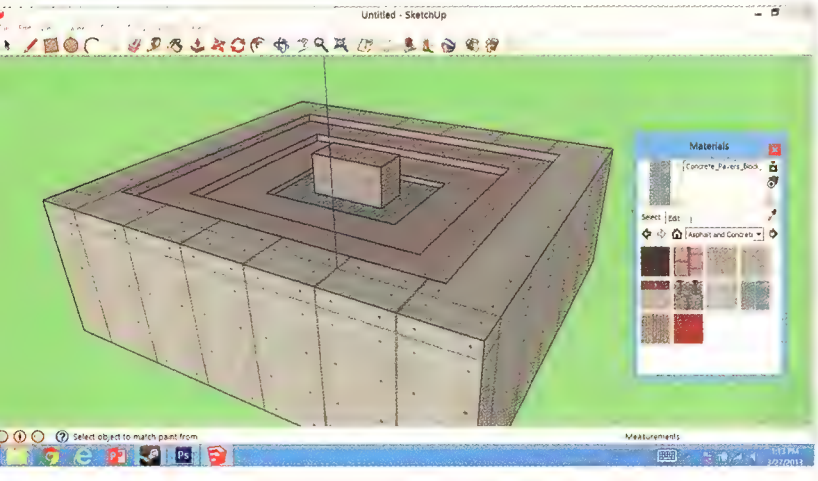
The program runs perfectly smoothly, and building 3D objects by extruding and morphing basic shapes using the touchscreen is very satisfying. For any sort of precision, you'll need the stylus, which is a natural fit for drawing lines and shapes on the screen, and then extruding those into 3D. The major drawback is that the stylus lacks scroll wheel and centre click functionality, which makes zooming and rotating the scene a chore.

DREAMWEAVER

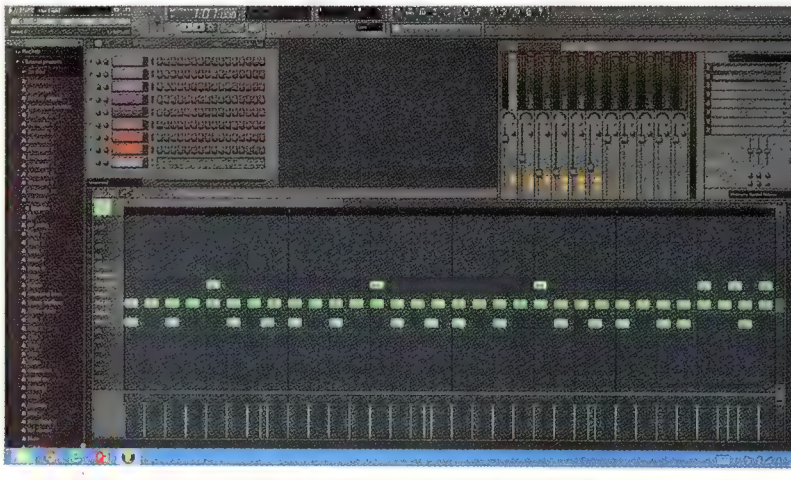
Dreamweaver suffers from some of the same interface issues as the other Adobe software, but on the whole there's very little drawback to using it on the tablet. The stylus is enough precision for most tasks in Dreamweaver and the Type Cover is convenient when you need to quickly drop into HTML view. The only thing we'd like to see in a future version of the Surface Pro is 3G for mobile publishing.

WHAT'S THE VERDICT?

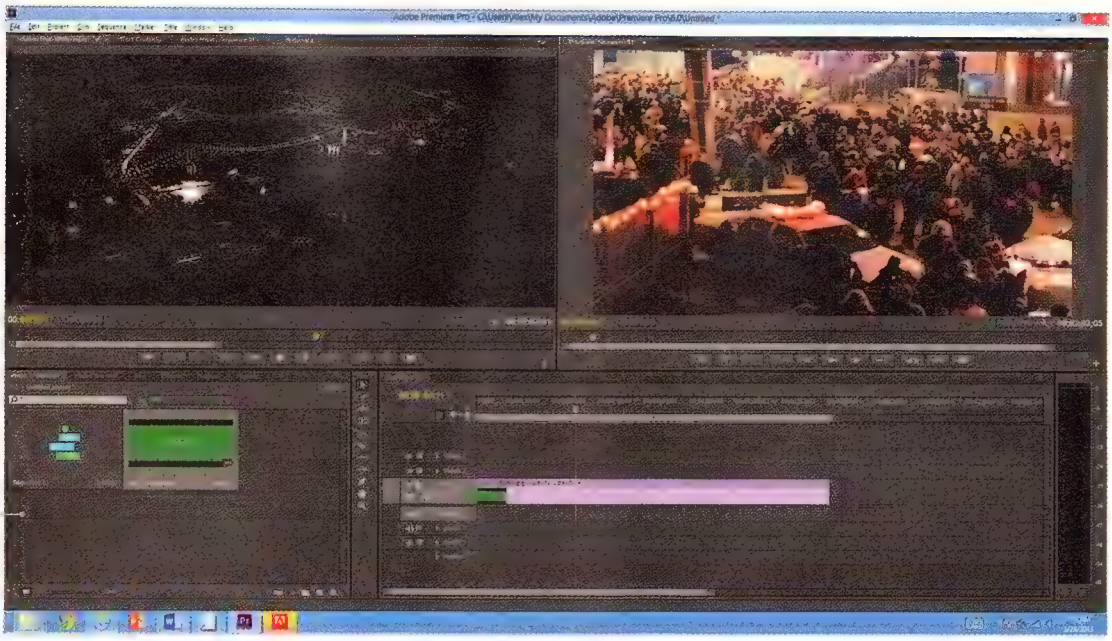
The Surface Pro is an excellent platform for designers who can pry themselves away from the Mac ecosystem. Full-featured design programs like Illustrator work like a charm on the Surface Pro and the stylus issues that gave us grief in art programs are much less of an issue here. If you're looking for a way to do high-quality design work during boring meetings or while sitting on the couch, you won't do better than the Surface Pro.



SketchUp is a blast to use on the tablet, even if the stylus slows you down.



DAW FL Studio is a little too dense for the small Surface Pro screen.



SketchBook Pro's interface features radial menus and can be quickly navigated with stylus swipes.

Premier Pro running on a tablet? We never thought we'd see the day.

FAIL MUSICIAN

Don't sell your workstations yet.

As a competitor to the iPad, the Surface Pro is a mixed bag. To start with, the app support just isn't there yet. The Windows Store is a little barren, and its minimal design and low number of user reviews makes it difficult to find the best picks. On the positive side, many apps in the store offer a trial option before you buy, which can be a big help in choosing the music tools that are right for your purposes. Additionally, we found the Surface's widescreen aspect ratio better suited than the iPad's for simulating keyboards and a variety of virtual instruments.

DIGITAL AUDIO WORKSTATIONS

The Surface's real advantage comes from its ability to use the full desktop version of your favourite Digital Audio Workstation (DAW) on the go. We tried out Cakewalk SONAR X2 and FL Studio on the Surface Pro, to see how it fared for mobile music production.

On one hand, it's unbelievable to have the sort of powerful production tools like SONAR in your lap on a small(ish) tablet. On the other hand, the Surface's hardware just isn't quite right for the software – DAWs are notorious for having cluttered, tightly packed interfaces, and we found it very hard to use them without a mouse, even with the stylus.

You *could* plug a mouse and external monitor into the Surface, but at that point you'd be better off with a workstation or a laptop. The Surface Pro's 4GB of RAM will hold you back in these programs, too, especially if you're working on a project with multiple sampled instruments.

WHAT'S THE VERDICT?

Using big-boy music production software on a tablet is novel, but it's just not a great fit.

MIXED VIDEO EDITING

Up to the task, if you are.

Going into our testing, the area where we most expected the Surface Pro to run into performance problems was in video editing. Rendering and encoding HD video are two of the most hardware-intensive computing tasks normal users do and the Surface Pro's hardware is good, but hardly cutting-edge.

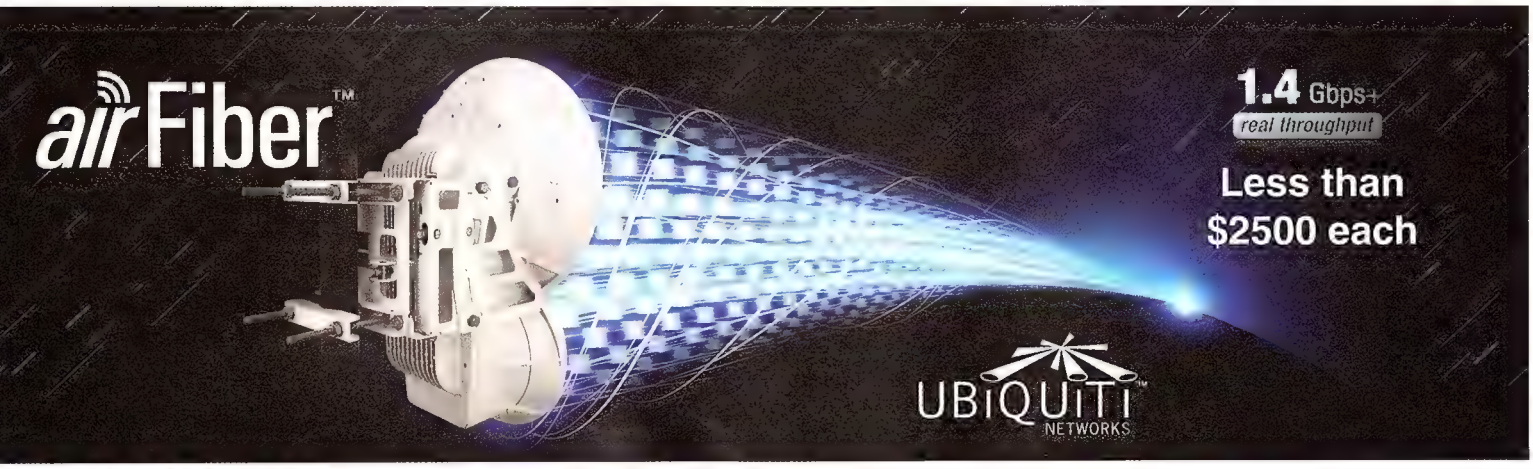
We were surprised to find that the Surface holds its own quite well in Premiere Pro. HD video rendering wasn't lightning-fast, but it was well within what we'd consider the acceptable range for home use. In our x264 encoding tests, the Surface Pro clocked in at around 6fps – a decent score that we'd expect from a low-powered desktop PC.

The only real issue we had with video rendering or encoding was that the Surface Pro, which has a tendency to run hot and loud, runs at its absolute hottest and loudest while performing these demanding tasks. It's not quite a deal-breaker, but the Surface gets hot enough that it's uncomfortable to hold for extended periods of time, or hold directly on your lap. In addition, we saw battery life drop precipitously while working with video.

The Premiere Pro interface is hardly touch-friendly and the software's interface is a little too dense. On the plus side, HD video looks so good on the Surface Pro's top-notch screen that you might not miss your larger monitor.

WHAT'S THE VERDICT?

The Surface is a surprisingly capable video editor and is a valid choice for putting together holiday videos in a hotel room or other low-level jobs. For professional or hardcore hobbyists, the Surface Pro's limited hardware will send you scrambling for your workstation. apc



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HAVE YOUR SAY

UNABATED WINDOWS 8 DEBATE

Never has an OS so polarised our readers. Windows 8 attracts equal numbers of detractors and supporters.

FORGET THE UI, WIN 8 ROCKS

Windows 8 is the best Windows yet. The UI *is* problematic and yes, Classic Shell helps replace the missing 'Start' button, but it's inevitable that Microsoft will address these issues. Microsoft may have been carried away by the success of laptops, tablets and smartphones (and lost the plot a bit), but it will also realise that many users are buying ever-larger screens for their PCs and those screens will not lend themselves to touchscreen manipulation. Who would want a touchscreen on their desktop? I can't imagine the injuries that will result from leaning over the desk and managing by touch on your screen.

So I am betting that Microsoft will incorporate a Classic Shell-style button or make the Modern UI an option selected on installation. Windows 8 is definitely faster to load and has been quite stable. So while I have never been a big Microsoft fan and usually have a Linux machine running as well, I think Microsoft deserves credit for Windows 8 and maybe a small redirect will enable it to get the kudos this release deserves.

Jeffrey Travers

Editor replies: *You're on the money, Jeffrey. It's expected that the next version of Windows, codenamed Windows Blue and likely to be known as 8.1, will have a 'Start' button and an option for booting directly into the desktop.*

WINDOWS 8 HAS TANKED

I have to take issue with your April editorial, in which you said you admired the Windows 8 vision. I have news for you: Windows 8 on the PC has tanked! It is ironic that the figures to show this came out around the same time as your editorial. In my opinion, being forced to use what is a touchscreen interface on a PC is a gimmick. Real work is still being done using the keyboard and a mouse. Why would I use a small screen when I can use one or more huge screens with multiple windows visible at the same time? Also, anyone who touches my screen risks physical harm. Why would I want to put my sticky fingers on my pristine screen? The position of the screen and keyboard is important, especially when you get older. A small touchscreen held at a distance, where older folk struggle to focus, does not work.

I could go on and on, but I have to get to work now – using Windows 7, never 8. I suspect that users' opinions on this were ignored so that Microsoft can force us into using the new interface – after all, Microsoft gets a percentage of every program sold.

Patrick Crisp

WINDOWS 8 IS COOL

I wanted to express my agreement with the April editorial in which you supported Windows 8. Your initial harsh judgement of Windows 8 is one that I shared, but now I have it on my desktop and I am really liking it. I've used Windows products since 3.1 and I must admit, when I first tried the beta of Windows 8 it was such a big annoyance. At that point, I thought I'd love Windows 7 forever and never upgrade. But I have some geek pride in trying to keep up with changes, so I eventually got a copy of Windows 8. Now I realise that the Modern UI can be customised and I'm gradually getting used to other new features. It loads especially quick with an SSD; you can start gaming in under 30 seconds.

My only question is: why didn't Microsoft include some new screensavers and more sample stuff? If I am building a system, just about the last thing I'll do is play *Ninja Tuna* to check the sound works. Part of what was great about Windows 7 was so much sample stuff and themes on the disc.

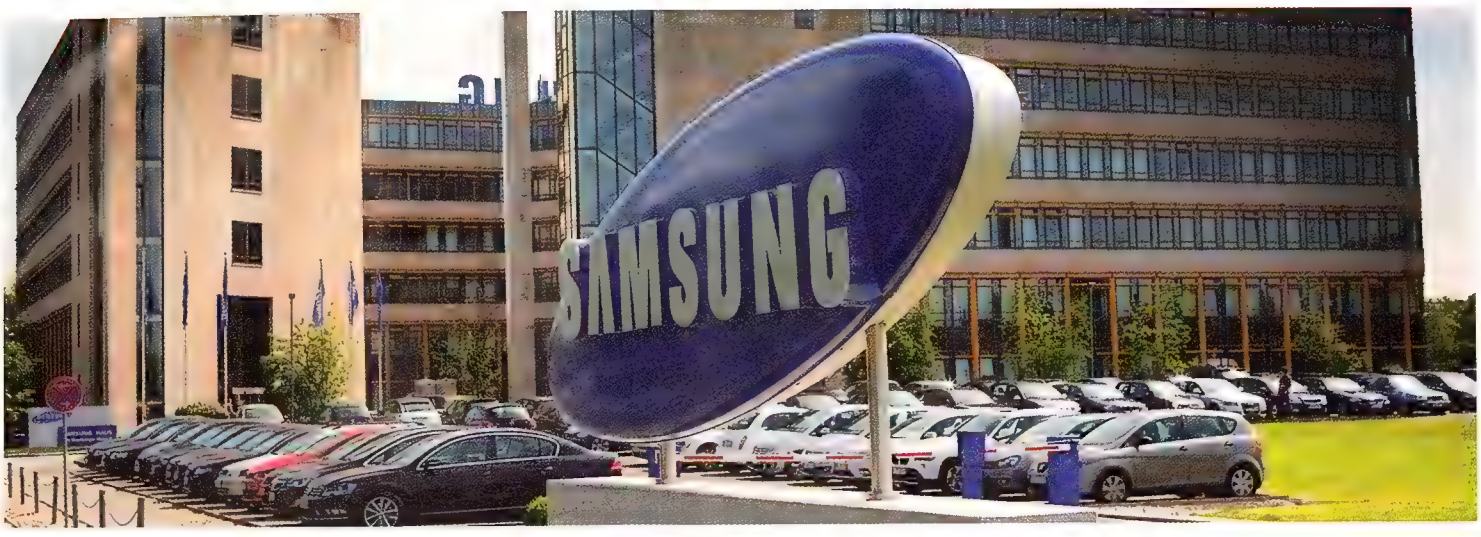
I'm sticking to Windows 7 on my Toshiba, as I think it's more practical on a laptop without a touchscreen, but I'm happy with Windows 8 on the desktop and will continue learning its secrets.

Simon Kitty

EPINIONS@APCTEST.COM

Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to epinions@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.



FAKE COMMENTS

Has Samsung engaged in questionable practices? Taiwan's Fair Trade Commission seems to think so.

Say it ain't so, Samsung. Just say it ain't so. Reports from Taiwan reveal that Samsung may have recruited students to post fake comments on internet forums criticising rival HTC. We're in shock here at End User because until now, we always believed all internet comments were real.

We've bought tech gear on the recommendations of anonymous forum posters, stayed away from restaurants whose meals were criticised by people called 'Michelin Star' and booked trips thanks to glowing recommendations in TripAdvisor's inscrutable forums. But now, Samsung's alleged corrupting of forums with fake reviews of HTC phones has cast a pall on the legitimacy of online comments as reliable guides.

Taiwan's Fair Trade Commission is apparently investigating Samsung after receiving a series of complaints. News agency UPI reported: "Taiwan's Fair Trade Commission said it had begun an investigation after receiving a series of complaints. A Taiwanese web site had published documents appearing to show Samsung had been recruiting students to criticise HTC and praise Samsung in anonymous web postings."

These documents, if proved real, may see Samsung fined up to 25 million Taiwanese dollars (about $820,000). The company says it has no knowledge of the Taiwanese investigation, but UPI reports Samsung published the following on its local Facebook page: "Samsung Electronics remains committed to engaging in transparent and honest communications with consumers as outlined in the company's Online Communications Credo. The incident was unfortunate, and occurred due to insufficient understanding of these fundamental principles." UPI said Samsung added it would conduct training of its employees to ensure such practices were not repeated and that it had ceased all marketing activities "that involve the posting of anonymous comments".

We couldn't find any trace of the apology when we checked Samsung's Facebook page, but regardless, we were appalled, so we investigated to see if there were any other examples of fake postings on the internet. To say we found a few is an understatement. The real question is whether there are any comments that *aren't* fake.

Even Amazon, from which we purchased books by noted British detective writer R.J. Ellory, was exposed for allowing fake comments. In fact, some of the glowing reviews for Ellory's award-winning book, *A Quiet Belief in Angels*, that described it as a 'masterpiece' and 'chilling' were written by the author himself. Ellory was exposed by another writer and admitted faking not only positive reviews for his own books, but attacking his rival authors, giving their books 1 out of 5 ratings.

Shaken by these revelations, we then stumbled on worse: the rise of 'reputation companies' that harvest comments about other businesses and then contact them, offering to remove some of the more offensive ones for a sum of money. This scam happened to a business in Salt Lake City. Jewellery store owner Tim Branscomb said he got a call from a 'reputation improvement company' saying that its web site had a negative review of his business online, but that it would take it off if he paid $500. It also offered to monitor the internet for other bad reviews of his business and remove them, like a protection racket. The review was clearly fake and when confronted, the scammers disappeared.

End User is appalled by all this fakery. It's clear why, despite their critics, we support Facebook and Google's attempts to force people to use their real names online. Getting rid of the blight of people hiding behind anonymity to post fake comments would take the internet to a new level of maturity and usefulness. APC

ENDUSER

Share the hilarity!

Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at contact@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

TABLET

INSIDE THE SURFACE PRO

This month we dissect Microsoft's Surface Pro tablet.

BACKGROUND

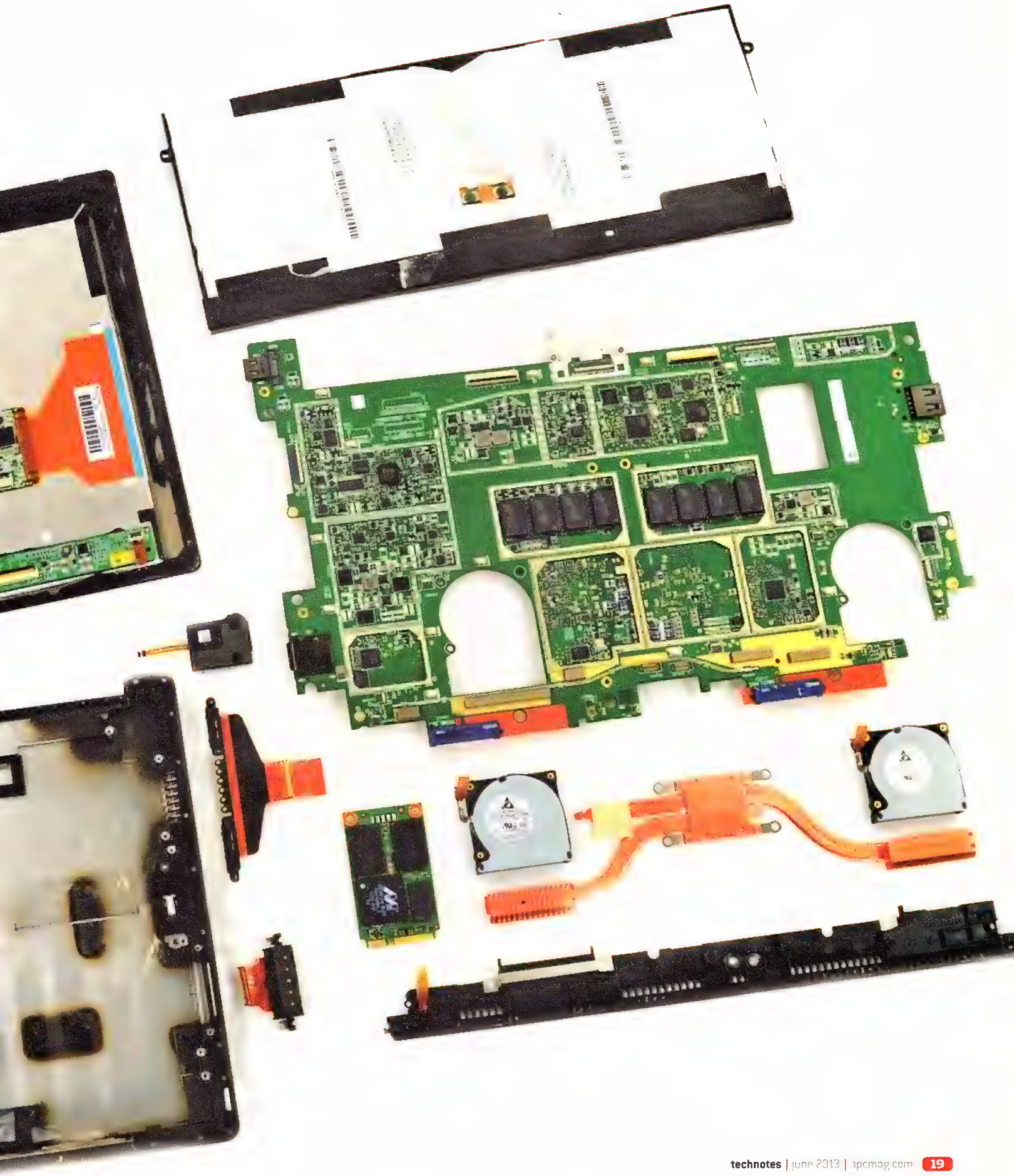
Microsoft's x86-based Surface Pro tablet is capable of supporting any software you'd run on a desktop PC. Unfortunately, it's not nearly as accommodating when it comes to repairs.

MAJOR TECH SPECS

- The full version of Windows 8
- 10.6in ClearType HD display (resolution of 1,920 x 1,080 pixels) with 10-point multitouch
- Third-generation Intel Core i5 processor with Intel HD Graphics 4000 (the same graphics found in current-generation MacBook Pro laptops)
- 4GB of DDR3-1600 RAM
- 64GB or 128GB flash storage
- Wi-Fi (802.11a/b/g/n) and Bluetooth 4.0

KEY FINDINGS

- A ridiculous amount of adhesive holds the screen in place, which makes accessing the insides tricky. Luckily, we had the required heat gun and guitar picks ready.
- Strapped to the back of the LCD is a small PCB, housing a Wacom W9002 chip that we assume is responsible for driving the Wacom electromagnetic resonance (EMR) digitiser system.
- After removing numerous screws and employing the help of a spudger, we extracted the motherboard assembly and SSD.
- The Micron RealSSD C400 packs 64GB of storage capacity in a tiny 1.8in form factor.
- The top of the motherboard features eight Micron 2LEI2 D9PXV 4Gb chips for a total of 4GB RAM, as well as a couple of touchscreen controllers and a Realtek ALC3230 audio codec.
- The bottom of the motherboard features the Intel Mobile HM77 Express chipset and a Core i5-3317U processor, among various other chips.
- Two small fans help keep the Surface Pro cool and the plastic top-rear bezel doubles as a vent for its laptop-worthy hardware.
- Microsoft sourced the Cadillac of batteries from LG: an Escalade 42Wh unit. The battery is rated for 7.4V and 5,676mAh. It's not soldered to the motherboard, so at least no soldering is required to replace it.
- There are more than 90 screws inside this device. The display assembly is extremely difficult to remove/replace. Tons of adhesive holds everything in place, including the display and battery. Unless you perform the opening procedure 100% correctly, chances are you'll shear one of the four cables surrounding the display perimeter. apc



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ASUS TRANSFORMER AIO P1801

It's a tablet! It's a desktop! It's both! Dan Gardiner benchtests ASUS's bold new experiment to remake the all-in-one PC.

You couldn't accuse Taiwanese component maker ASUS of being unambitious. Over the last half a decade or so, the company's managed to carve itself a prominent role in the laptop market and it's now aiming to do the same for tablets, all-in-one PCs and perhaps even smartphones.

On the latter fronts, ASUS has had varying luck, with its experimental range of two-in-one devices, such as its Transformer Android hybrid tablets that packed removable keyboard docks and more recently, with its slightly oddball PadFones. The PadFones offer the combo of an Android smartphone that slots into the back of a 10in tablet housing. While that sounds vaguely appealing on paper, the implementation has left something to be desired.

The Transformer AiO is the newest addition to this two-in-one line and it's perhaps one of ASUS's better efforts. True to form, it bundles together two devices, fusing a Windows 8 touchscreen PC with a display that can be quickly detached to operate as a completely standalone Android tablet. A frikkin' humungous Android tablet, it should be mentioned, with a screen that measures 18.4in.

So, is this an idea so crazy it actually works, or something that's best left to the dust heap of computing history?

IT'S STILL A PC

All the parts to run Windows are housed in that rather unassuming black base station, which sits atop a sturdy stand. It's about the size of an unusually tall trade paperback book, turned on its side.

Despite that slim size, this is still a pretty grunty unit. We tested the higher-end $2,399 model, which bundles in a proper desktop PC chip (Intel's Core i7-3770 – the fastest mainstream CPU currently on offer) plus 8GB of RAM, a 2TB hard drive, Gigabit Ethernet, 802.11n Wi-Fi and four USB 3.0 ports. About the only thing that's conspicuously absent is an SSD, but that processor and RAM help compensate to a good degree, and in both subjective and benchmark testing, this is a bit of a screamer. It rips through audio and video encoding tasks as fast as any all-in-one PC we've tested, and the tablet/display is nice and responsive for touch-based tasks in Windows 8.

The base also includes an HDMI output, so you can plug in a secondary display and thus continue to use the base as a Windows PC if you want to go walkabout with the tablet.

One thing it's not is a high-end gaming rig. Graphics performance with the AiO is on the basic side, even by all-in-one PC standards. While the Nvidia GeForce GT 730M chip inside delivers better performance than what you can squeeze from an Intel integrated chip (like the HD 4000), it still only just scrapes by in modern games. In benchmarks, it managed a just-playable 30fps on Low details with new release titles like *Bioshock Infinite* and *Tomb Raider*.

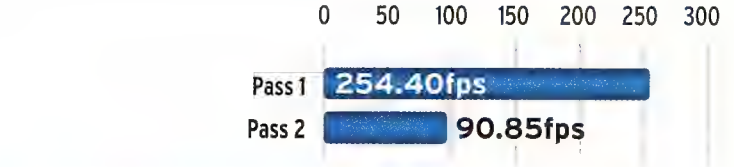
That said, that's more than enough grunt to run the touch-based games available through the Windows Store, so this one is capable of gaming – it just depends on what your definition of gaming is.

A TABLET OF BIBLICAL PROPORTIONS

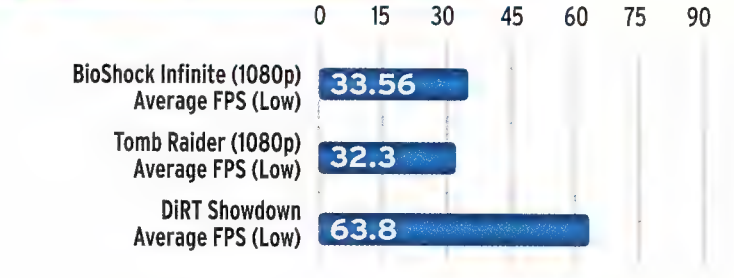
Removing the tablet from the base is simply a matter of pulling it upwards. We might have mentioned it's a little on the large side – it really isn't something you'll be taking with you on a bus, train or plane – and it won't fit in most backpacks or even messenger bags. This is more a

WINDOWS TEST RESULTS
GENERAL PERFORMANCE

x264 Benchmark 5.0.1



GAMING PERFORMANCE



7/10

$2,399

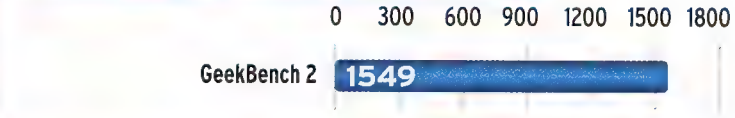
www.asus.com.au

Unique yet well-implemented idea.

Hardware will soon be superseded, particularly in tablet.

ANDROID TEST RESULTS

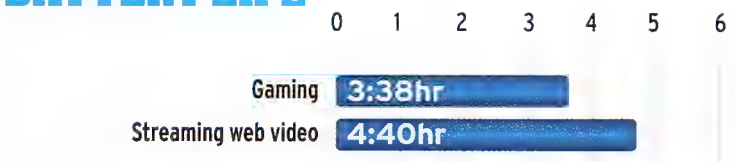
GENERAL PERFORMANCE



GAMING PERFORMANCE

GLBenchmark 2.5.1

BATTERY LIFE



'Moses and the Ten Commandments' style slab that needs to be placed on a desk or fully cradled with one entire arm. It's still comfortable when used in your lap or on a table, but it does need something to rest on for prolonged use.

While that size limits portability, the weight of 2.4kg is light enough that you can comfortably move it around the house. That extra screen size does confer certain benefits when it comes to both productivity and entertainment, too.

For example, you could undock it and use it as a portable screen on which to stream movies to the bedroom. Want to play games? Add a PS3 gamepad, Power-A MOGA or similar games controller and you've got a humungous gaming tablet that you can take on holidays. Disappointed that they've killed broadsheet newspapers? Throw this on your dining table in the morning and you'll get a similarly big experience. And for artistic pursuits, like digital drawing or painting, that size will be a boon, giving you a huge canvas on which to work.

You get the idea. Unshackling the screen from the PC and letting it work as a tablet does open up the possibilities immensely and should let you avoid the 'gorilla arm' problem associated with holding up your arms to use a touchscreen PC for prolonged periods.

When it comes to the underlying hardware, the tablet is actually fairly pedestrian. This is an Nvidia Tegra 3-powered unit like many of ASUS's more petite models, running Android 4.1.1 and with 32GB of onboard storage (a microSD slot will let you add up to 64GB more).

WINDOWS ON TABLET

The tablet isn't strictly limited to using Android, however. Via an included Android app, you can stream Windows from the base station to the tablet over your Wi-Fi for a remote desktop experience. (By default the tablet actually fires up the streaming app and connects as soon as you undock it.) This remote desktop mode isn't quite perfect – there's some image compression and there can be a tiny bit of lag, but we found day-to-day apps and even Windows 8 tablet games were still perfectly usable.

You can also optionally use the tablet in Android mode while it's docked (there's a dedicated mode switch button on the side) and doing so automatically connects the mouse and keyboard to the Android OS.

That said, Android isn't quite ideal for this size screen. We didn't have a problem with apps running, but at roughly four times their intended 10in screen size, they can often feel like oversized Fisher Price versions of the real thing. What's really missing from the equation is some kind of windowed multitasking, like we've seen appearing on some Android handsets of late. Even just the ability to run two apps side by side, like Samsung has introduced on its Galaxy Note II and S III, would have made helped the overall usability.

It's not just apps that can be problematic; Android gaming is mixed, too. Dual-stick games (like third- and first-person shooters) are playable, but we found we had to use our fingers rather than our thumbs.

On the plus side, the tablet just about lives up to ASUS's 5-hour battery life claims. In our Labs testing, with the screen set to 50% brightness, we managed 4:40hr streaming *ABC News 24* and 3:38hr when undergoing 3D gaming. Considering the size of the screen, those are impressive numbers.

THE VALUE QUESTION

By and large, all-in-ones are an expensive class of PC, so the AiO's starting price of $1,999 (with a Core i5 chip and 1TB hard drive) isn't too bad, considering you're essentially getting two devices. And while the Transformer AiO is an unusual offering, it's one that we think will still have appeal to some households and in certain business scenarios. The flexibility it allows is something that should be commended, letting you essentially move your whole PC around to different spots in your home.

In fact, for us the main problem with the AiO isn't the overall concept or even implementation – it's in timing. With major new ARM and x86 chips arriving from Nvidia and Intel (Tegra 4 and Haswell, respectively) in the next couple of months, the Transformer AiO has arrived pretty late in the current hardware cycle. Six to eight months ago, that premium price would have made more sense, but with a newer, faster kit just around the corner (particularly on the ARM front), we'd be tempted to wait and see if a Transformer AiO 2 isn't a bit quicker off the mark.

Dan Gardiner

4/10 BenQ XL2720T

A 120Hz, 27in BenQ TN panel. How bad can it be?

MONITOR

www.benq.com.au @

$599 $

Large screen, 120Hz refresh rate. ✔

Washed-out colours. ✖

BenQ has made some of the finest 3D monitors around. Admittedly, that's not necessarily because of how good these screens are at recreating the faux 3D Nvidia wants to jam down our eyeholes, but mainly because of how good they are as general 120Hz screens.

Using the LightBoost tech that's accompanied Nvidia's 3D Vision 2 advances, BenQ has been able to create some very impressive 24in displays that almost put a dent in our pleasure at seeing so many affordable IPS screens hitting our desktops. The quality of the TN panels BenQ has been using hasn't made us pine for the improved viewing angles and colour reproduction that even budget IPS screens offer – that 120Hz refresh has made us forget them almost altogether.

We say almost because what it's really done is make us long for the days when we actually get some 120Hz IPS panels gracing our homes. In the meantime, these quality TN screens are great for gaming and general desktop use, whatever your feelings are towards the dead duck of 3D gaming. And while we're still yet to see a 27in IPS screen with a 120Hz refresh rate, we're seeing 27in TN screens with a buttery-smooth pixel clock. It's just a shame that the actual panel BenQ is using in its latest monitor isn't up to the standard we're used to.

It's especially sad because I checked out BenQ's XL2411T and that has one of the best TN panels we've ever experienced. We had high hopes for this XL2720T, but sadly those hopes were dashed the instant we booted into a horrendously washed-out Windows 8 'Start' screen.

The vibrant colours of our lovely tiled display were barely present, considerably faded compared to the 27in AOC IPS screen we'd become used to. That meant we had to delve into the onscreen display and find the optimal settings ourselves. Luckily, the only design difference between the XL2720T and the smaller models is that it's using a slightly larger chassis than the classic XL2420T. The best part about that is it still has the same fully adjustable stand and a fantastic OSD.

We're not being sarcastic, either – it's truly the finest example of an OSD we've ever used, offering simple touch and context-sensitive buttons, side by side with the actual onscreen menu. However, it still took us an age to get to grips with what we needed to change to inject a little vibrancy into the colours. And even once we'd got a close approximation of what we were used to, the image quality couldn't really compare. And this is a $600 screen against one that's almost half the price, with the same panel size and native res.

With those problems arrayed against it, not even the 120Hz refresh rate can soothe our unhappy eyes. And no matter how good the chassis and OSD are, the weak colour reproduction, poor black levels and over-saturated whites make this a pricey 27in screen to avoid.

Dave James

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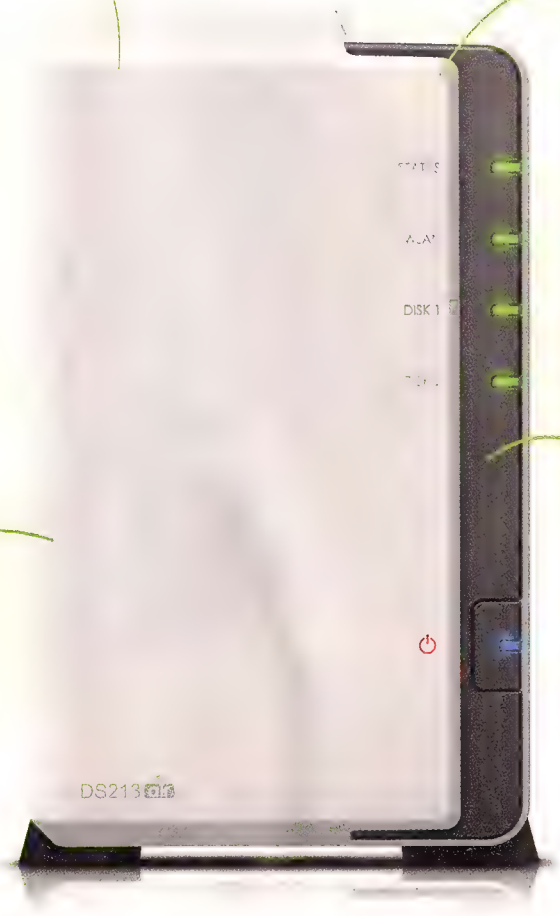

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DSM 4.2

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www.synology.com

7/10 MSI GX60

MSI's new gaming portable makes pixel-pumping the priority.

LAPTOP

au.msi.com @

$1,299 $

Affordable for a gaming rig, power efficient. ✔

Not portable, disappointing gaming and CPU performance. ✖

Can there ever be such a thing as enough CPU power? MSI seems to think so, with the release of the MSI GX60 gaming laptop. That's because it pairs one of AMD's A10 Fusion CPUs with the HD 7970M graphics chip. So that's a budget-orientated chip combined with the fastest GPU AMD has.

MSI really is pushing that notion of good enough CPU performance to its absolute limits. Whether it works will depend on the ability of that A10 processor to maintain playable frame rates at all times. The upside of this decision comes down to two things: the A10 chip is cheaper than a high-end mobile CPU and it's also more power efficient.

Price wise, when compared to the Samsung Series 7 Gamer, powered by Intel Core i7 and Nvidia's GeForce GTX 675M, and yours for $2,999, the MSI GX60 is really cheap.

The A10 chip is the top-spec 4600M – that's four AMD-style CPU cores or two AMD modules, humming a 2.3GHz tune as standard with a top Turbo frequency of 3.2GHz. Each module contains two integer units and a single floating point unit. Is it really a quad-core chip? Probably not, but it's certainly more than a dual-core processor.

The A10-4600M also sports an integrated HD 7660G graphics unit with 384 shader cores. However, the real grunt is provided by the dedicated HD 7970M chip and its 1,280 shaders, 850MHz clock speed and 256-bit memory bus.

Mass storage takes the form of a conventional 750GB magnetic drive, but MSI has also slotted in a pair of 64GB mSATA solid-state drives in a speedy RAID 0 setup. As for system memory, we're talking two 4GB sticks of 1,600MHz DDR3 memory. Then there's the 15.6in Full HD LCD panel – that's 1,920 x 1,080 and a very high pixel density.

One thing the MSI GX60 isn't is portable. As a 15.6in laptop, the chassis isn't huge in width, but a fairly fat bezel around the screen means it's quite large for this class of laptop. The raw CPU performance is also unimpressive. The A10 CPU's Piledriver cores don't have a reputation for immense performance, and with only four running at relatively modest clocks, the result is a mediocre score in Cinebench. To put that in context, a quad-core Intel Core i7 desktop processor is roughly four times faster.

The performance of those two 64GB mSATA SSDs in RAID 0 is also a little patchy. A peak sequential read speed of nearly 600MB/s is spectacular, but writes of just 52MB/s are really poor. Frankly, the GX60 would be better off with a single conventional 2.5in SSD. The sequential reads would be a little slower, but everything else would be far quicker and more responsive in normal use.

Sadly, the GX60 doesn't deliver where it really counts: in the gaming department. A perfect example of where it falls short comes in the form of arcade racer *DiRT Showdown*. Hardly renowned for being a CPU hog, the *DiRT* spin-off runs at pretty much the same frame rate, regardless of the graphical settings. The result is low- to mid-20s in terms of frames per second.

There's no doubt the MSI GX60 makes for a compelling package on paper, but in practice it leaves a lot to be desired. It's just about tolerable for most current games, but there's absolutely no performance in hand for future releases. It ends up making the HD 7970M dedicated graphics chip seem a little wasted and ultimately leaves the GX60 feeling off-target.

Jeremy Laird

7/10

ASUS GTX670-DCMOC-2GD5

The only thing miniature about this card is the small form factor.

GRAPHICS CARD

www.asus.com.au @

$490 $

Compact card, runs fast and cool. ✔

Expensive, cheaper competitor products. ✖

With the next Xbox being touted as simply a small form factor Windows 8 device, and the rise and rise of ever-smaller components in computing in general, it really was only a matter of time before we started to see the graphics card manufacturers getting in on the increasingly popular miniaturisation game. This is also the first high-end graphics card we've come across that's been designed from the ground up for the mini-ITX crowd and it's an impressive thing to behold.

When we first saw the GTX 670 in reference trim from Nvidia itself, the size of the PCB, compared to the size of the cooling, instantly jumped out at us. The 173mm circuit board only took up just under three-quarters of the length of the card as a whole, with the extra length catering for the reference cooling solution needed to keep the GK104 GPU honest. The real surprise is the fact that it's taken this long to get to a stage where we're seeing card manufacturers coming out with their own cooling arrays based on the size of the PCB, rather than just the size of standard cards.

We guess the issue has been one of trying to ensure you get enough heat dissipation in a smaller cooling setup – to try and make sure the GPU can carry on operating at the sorts of speeds something like a GTX 670 needs to. Impressively, this GTX 670 Mini more than manages this feat. This is no reference-clocked card – this is a proper overclocked unit.

The chunky DirectCU cooling makes the GTX 670 Mini a hefty card and that weight really does make it feel like quality engineering at its best. And the fact it can run so comfortably at the speeds it does is admirable. This ASUS card runs quicker, cooler and quieter than the reference card from Nvidia, and in a much smaller form factor.

So, in engineering terms at least, the GTX 670 Mini is an absolute winner. Sadly, that's not the only way you should think about this card. As much as it's a niche product, with a niche audience – and that always incurs a price premium – we can't help but feel that at nearly $500, this is an incredibly expensive graphics card. We understand that you're not going to find a card as quick and as small as this anywhere else, but you've really got to desperately want this form factor to part with this much cash for it.

The simple fact is, you don't need to. Because of the rise in performance from mini-ITX components, chassis manufacturers such as Cooler Master and BitFenix have managed to figure out how to get full-size cards into mini-ITX boxes. And if you want to go for smaller cases, the length of your GPU isn't the barrier to squeezing it in – it's the height and the power demands. So, as much as this is an impressive feat of engineering, you can already pick up faster and cheaper cards, such as the top-end Sapphire HD 7970 GHz, and drop them straight into a funky mini-ITX form factor – just like that.

Dave James

HIGHLY apc RECOMMENDED

8/10

MLN Venom BlackBook 15

A good-value gaming option.

LAPTOP

www.mln.com.au @

$1,799 $

Packs all the gaming necessities, doesn't look awful. ✔

No SSD, loud fans when gaming. ✖

If you had the chance, how would you go about designing a gaming laptop? If the answer is 'inexpensive, powerful and with low-key looks' then you're thinking along roughly the same lines as Australian retailer MLN, which is exactly what it's aiming for with its new Venom BlackBook range.

This 15.6in model is the baby of the family, though it's physically still quite a beefy machine that isn't particularly light or slim. At 3.1kg this is better suited to deskbound duties, perhaps being shuttled between home and work, rather than being carted around everywhere. What it has going for it in the looks department is a fairly discreet style – at least compared to most gaming laptops adorned with flames, dragons and enough neon lighting to put a strip joint to shame. It also still packs in all the components you'll need to enjoy the latest games with a pleasing amount of visual bells and whistles.

At the heart of that is the graphics chip and here that's a reasonably powerful Nvidia GeForce GTX 670M – three down from the top of Nvidia's laptop graphics chips. Pair that with an Intel Core i7-3630QM CPU, 8GB of Corsair memory, a 1TB hard drive and a matte-finish 1080p screen, and you've got a good basic gaming recipe.

We duly tested the BlackBook's prowess by firing up two of the latest games, *BioShock Infinite* and *Tomb Raider*, alongside last year's *DiRT Showdown*. It didn't disappoint. At the screen's native 1080p resolution, all three maintained above 50fps on Medium detail settings, and we even pushed them to High details with real-world testing and found them more than playable. However, all three struggled to really go beyond that.

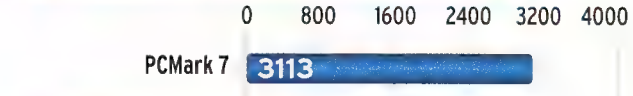
The BlackBook 15 does have a few drawbacks. As with most gaming laptops, this one's not quiet when it gets going, with a loud exhaust system that spins up almost immediately upon firing up a game. If you intend to use this one with speakers, you may find this annoying. Our review sample also had a darkish cast to the screen, which while making blacks pitch-dark and adding an earthiness to most tones, did slightly throw off certain colours. This was particularly noticeable with *DiRT*'s vibrant greens, which looked more like pale yellows.

Likewise, in terms of internal components we would have liked to have seen an SSD. Without one, the BlackBook 15 lags behind when it comes to boot speed and launching games and apps; however, at this low price it's understandable that it's been omitted. And to its credit, MLN does offer several options for adding an SSD – at an extra cost, of course.

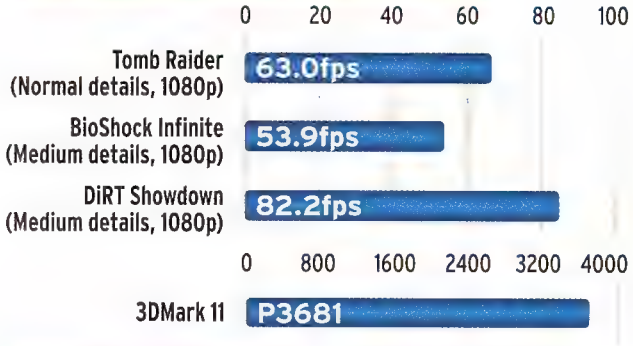
Despite that shortcoming, the BlackBook 15 adds up to a fairly compelling option and one that outdoes most of the big-name brands on value. If you're after an unassuming gaming laptop on a budget, you could do a lot worse.

Dan Gardiner

GENERAL PERFORMANCE



GAMING PERFORMANCE



BATTERY LIFE

6/10 Acer Aspire V5-431P

Shoots itself in the foot.

LAPTOP

www.acerstore.com.au @

$699 $

Covers all the basics and includes touch. ✓

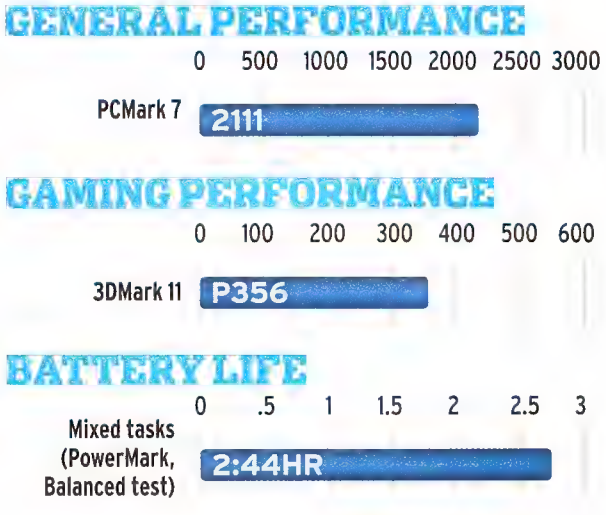
Can't compete with its own siblings on price. ✗

If any one thing can be said to have killed the netbook, it's likely been the flood of low-cost laptops that have hit the market in the last two years. It's now possible to get a unit that covers all the basics for around $400, which makes the $300 price tag of netbooks seem rather steep. The resulting race to the bottom has become a fairly cutthroat one, however, with vendors constantly experimenting to see just how much they can throw out to get that price down.

This Aspire attempts to strike a balance between cutting-edge features and a fair – but not bargain basement – price. On paper it has everything you could want in a laptop that sells for $600 on the street. Its 14in dimensions give it a good mix of usability and portability, although at 2.14kg sans power brick, it's not quite 'go-everywhere' light. The black and silver MacBook stylings give it some visual class, there's a big chiclet keyboard that has lots of space between the keys, a nice, large trackpad and despite its smaller size, a DVD writer. Oddly, there's no built-in Ethernet port, but you do get a custom dongle that adds the latter, as well as VGA output (HDMI is built in). Throw in a dual-core 1.8GHz Pentium 2117U, 4GB of RAM and a 500GB hard drive, and you've got a well-rounded machine that's not conspicuously missing anything.

Where the V5 adds cutting-edge to that equation is via a 10-point touchscreen, letting you stab, flick and stroke around Windows 8's Modern UI. While that touchscreen was fast and responsive in testing, the problem is that at this stage, there's little in the way of must-have touch apps for Windows 8.

Its performance was also a bit mixed. While that Pentium is fine for the basics of email, web surfing and watching movies, it falls over when you throw something like media encoding at it, where its older architecture proves drastically slower than what you'll get from Core i chips (even a lowly Core i3).



Likewise, this is categorically not a gaming laptop. Touch games from the Windows Store should run OK, but the latest big-name games like *Tomb Raider* and *BioShock Infinite* aren't playable – at least not at anything but the lowest details and screen resolution.

Those performance shortcomings admittedly aren't too unexpected at this price point, but it's ultimately price that does the most to damage its appeal. While you can commonly find this Pentium model for under $600, even at that price it's competing against some low-end Core i3 machines. As a case in point, at the time of print the Core i3 version of this very machine, which still offers that same 10-point touchscreen, could be found for around $599 online. Acer's essentially undercut its own entry-level unit with a better, faster model of the same machine, which makes it impossible for us to recommend this lower-end one.

Dan Gardiner

7/10 Razer Orbweaver

There's niche and then there's the Orbweaver.

KEYPAD

au.razerzone.com @

$179.95 $

LED backlighting, ergonomic design. ✔

Very pricey. ✖

What the living hell is a gaming keypad? Well, it's the result of a loving union between a joypad and a gaming keyboard. Kind of.

It's a smaller keyboard – here with just 20 keys – and is designed to be used one-handed with all the keys within reach at all times. There are generally additional buttons for the thumb and everything is totally configurable.

The Orbweaver is designed as the perfect accompaniment to a gaming mouse in the right hand, with this sitting beneath the left, making the more general-purpose keyboard redundant. Well, in gaming terms, anyway – there's no way you could realistically replace your standard board with this. So in effect, a gaming keypad is going to be a third peripheral plugged into your PC.

They're something we haven't seen for a good while – we remember a Belkin-branded/Razer-powered SpeedPad and an absolutely awful Wolf Claw Devour we checked out at the tail end of 2008, but we've seen nothing since. The SpeedPad had some things going for it, but the Wolf Claw was horrific.

Thankfully, the Orbweaver is almost entirely different. For a start, Razer has loaded it with its top keyboard tech (individual LED backlighting and mechanical switch keys) and the ergonomic design is really impressive, too. Peripheral manufacturers have finally realised that not all hands are created equal and the Orbweaver incorporates some excellent configuration options in its makeup.

Razer's Synapse 2.0 software makes every one of the keys, D-pad directions and buttons fully programmable – either with individual key presses, mouse actions, shortcuts or macros. Each profile you create can be linked to a game executable, so the profile is selected the instant the game loads. Each of those profiles has up to eight key maps, so you can switch between them with ease.

It's comfortable, well-built and incredibly flexible, although it's still not without its problems. Those aren't necessarily the fault of the Orbweaver itself. They're more down to the technology and the type of device it is. As we said before, this can't replace a keyboard, so it's going to take up even more desktop space. Also, despite the LED lighting it only shows the numbers one to 20 on the keys, with no indication what they're actually mapped to, so they may as well be blank.

Until we find cheap ways to use OLED displays on top of mechanical switches, you're going to have to keep every single key map in your head.

Sadly, us tech journos aren't a particularly well paid bunch, so when it comes to checking out some new expensive, ultra-niche peripheral it can be tough to maintain some sort of perspective. We couldn't in all good conscience recommend anyone spend over $150 on a keypad, but we know there are some folks out there for whom the Orbweaver will be a fantastic device. To them it may even be worth that much cash, but as well made as it is, it's still a lot to ask for such a niche device.

Dave James

8/10 Roccat Isku FX

A gaming-centric keyboard with all the colours of the rainbow...

KEYBOARD

www.roccat.org @

$95 $

Excellent software, coloured backlighting. ✔

Overpriced. ✖

Roccat's Isku gaming keyboard has been around for a while – we first reviewed it in 2011 and a fine board it was, too – although times change and technology moves on. So what does this new Isku FX have to offer in a world full of quality mechanical-switch boards?

We've been using Roccat's versatile Isku keyboard for a good while now and we're yet to find the answer to that question. After all, not a lot has really changed with the Isku FX, compared with the original board design. The chassis is the exact same angular plastic, with a roughened texture on the wrist rest to stop you slipping off in the heat of battle. And it's still chock-full of extra buttons and fully programmable macro keys. Most of all, it's still got the impressive software stack: the innovative Easy-Shift[+] and Roccat Talk tech.

Those were the key selling points when the keyboard first came out and the Easy-Shift[+] software is still a smart option for a gaming keyboard. It allows you to use Caps Lock like a standard Shift key in-game, adding alternative key press into the selected profile. That means each key in the Easy-Zone – the 20 keys around the W, S, A and D buttons – can have alternative functions in-game. The idea is that you don't need to move your gaming claw from the relevant keys to hit different functions in control-heavy titles.

The nifty Roccat Talk tech allows different Roccat peripherals to communicate with each other, so if you've got a keyboard and mouse from the same company you can use them nicely in conjunction. The Easy-Shift[+] function extends to the mouse as well, providing a selection of alternative button presses.

Roccat hasn't changed a thing about the tech in the Isku FX, so what's the big deal and why the near-$100 price tag? Well, now you can do it all with different colours illuminating your keys rather than just blue. So yeah, not a lot of extras.

If the market hadn't moved on at all we'd simply be saying Roccat had updated its excellent keyboard with some neat aesthetic extras. Unfortunately, things have changed and while we do still see some big names putting out high-end boards with membrane-switch tech, a lot of manufacturers are hitting the market with mechanical switches instead.

When you've got Corsair and Gigabyte producing some of the finest gaming keyboards around with the resounding clack of mechanical switches for the same sort of price as this membrane-switch board, you're presented with a tough choice. Where the extra functionality of the Isku FX used to be a bonus feature for a gaming board, now it's a deciding factor in whether you buy it or not. You're really going to have to want the extra functionality to trade off the dead action of a membrane board against a quality mechanical-switch keyboard.

Luckily, the Roccat software is really good and the keyboard is as responsive as membrane-switch boards get. But at $95 it makes for a tough recommendation over the top gaming boards from Corsair and Gigabyte.

Dave James

5
10

www.sapphiretech.com @

$180 $

Cheap, GCN tech. ✔

Disappointing performance. ✖

GRAPHICS CARD

Sapphire HD 7790 1GB GDDR5 Dual-X OC

Slower than its predecessor.

For the last year or so, AMD has been able to claim almost total control in the graphics world in terms of both raw performance and great value. The HD 7970 GHz edition held the top spot in terms of the single-GPU, high-end graphics battle with the GTX 680, and further down the stack AMD cards held sway. At every price point AMD had a card that was at once cheaper and faster than the Nvidia competition.

This has rankled the green graphics team and we've since seen Nvidia launch the impressive GTX Titan, a beefy professional-class graphics card that's incredibly fast and expensive. That allowed Nvidia to take back the high ground in the single-GPU performance stakes, although AMD still claimed overall leadership with its multi-GPU monster from ASUS: the Ares II. The Titan has also prompted AMD to start making its own dual-GPU HD 7990, rather than just leaving the partners to take up all the slack.

At the low end, AMD has been pretty much unrivalled, with the likes of the HD 7850 1GB card and the amazing HD 7870 XT turning up and rewriting the performance books for sub-$300 graphics cards. Nvidia's lineup simply couldn't compare. They were either too expensive or just plain wimpy.

This price/performance failure in the serious volume segment of the market must have really ground the gears of Nvidia. So where AMD is revising its lower-end card with the HD 7790, Nvidia is upping the stakes and has released the GTX 650 Ti Boost. This new card has put Nvidia right back in the race at this price-sensitive end of the market. We predict it's going to sell a lot of these great performing cards.

WHAT THE?

So, what has AMD done with the HD 7790 to mess things up so badly? Well, for a start, it's meant the end of the excellent HD 7850 1GB card. That's something that really sticks in the craw for the simple fact that at $180, it was easily the fastest card in that price point, taking both the GTX 650 and GTX 650 Ti outside for a good kicking whenever they tried posting benchmarking figures.

The problem for AMD was the fact that the Pitcairn Pro GPU that sits at the heart of the HD 7850 is still a relatively pricey chip to produce, with nigh on 3 billion transistors across the relatively large 212mm² die. Not only that, but the beefy 256-bit memory bus – the part that allows such great performance despite the limits of the 1GB frame buffer – is also going to add a decent chunk of cash onto the price of production. We guess AMD wanted to change things around and replace this card with one that's cheaper to produce, while remaining at the same price tag. So we're left with the HD 7790, which in itself isn't necessarily a bad card, but with obviously weaker all-round performance issues.

BONNAIRE & CLYDE

The new GPU AMD is debuting here, the Bonnaire XT, is the first Graphics Core Next (GCN) 2.0 part we've seen and it doesn't really do a lot for our gaming sensibilities. The '2.0' tag is a bit of a cynical misdirection on the part of AMD, though. This isn't really a new spin of the architecture – it's simply the second generation of chip to be using the same GCN tech that was introduced with the HD 7000 cards around 18 months ago.

The Bonnaire XT GPU is much cheaper to manufacture than the Pitcairn Pro. It's significantly smaller in die size and transistor count, losing nearly 800 million transistors and chopping the GPU down to 160mm². AMD has also hacked the memory bus in half with the HD 7790 – this time only having a 128-bit bus to channel its 1GB frame buffer.

So yes, it's both cheaper to produce and slower than the HD 7850 1GB, yet it's hitting retail for pretty much the same price.

8/10

@ www.asus.com.au

$ $220

✔ Great value and performance.

✖ None.

GRAPHICS CARD

ASUS GTX650TIB-DC2OC-2GD5

Nvidia's great comeback.

That leaves a bad taste in the mouth and some jerky gaming performance on your monitor. Granted, at 1080p it still performs pretty well in the latest games, with only *Crysis 3* and *Sleeping Dogs* really causing it trouble at that resolution and dropping the average frame rate below 30fps, but considering the HD 7850 1GB gives great benchmark results, it feels a little bit like a slap in the face.

If it were just a question of AMD replacing a great card with a mediocre one at the same price it would be bad enough, but Nvidia seems to have finally learned a lesson with this latest generation of cards and has done some genuinely impressive and effective things to its otherwise limp GTX 650 Ti card. The new GTX 650 Ti Boost is retailing for around the same price as the original GTX 650 Ti, delivering much better performance than its predecessor and significantly, the HD 7790.

ROLE REVERSAL

It's almost a complete reversal of what AMD has done with its HD 7790. The Boost is actually based on the same board as the GTX 660, which accommodates the improved 192-bit memory bus and the 2GB GDDR5 frame buffer. That memory is also running quicker at the now-standard 6GHz rather than the 5.4GHz it was set at with the original GTX 650 Ti. If that wasn't enough, Nvidia has also upped the clock speed and unleashed its GPU Boost tech on this lower-caste GPU – something it originally called a halt to below the GTX 660 in the graphics stack. And to top it all off, the Boost is also running with the same ROPs count as the GTX 660 at 24, rather than the 16 of its non-Boost predecessor.

All that adds up to some impressive performance, only just short of the pricier GTX 660 and well ahead of the GTX 650 Ti. It's also much faster than the competing HD 7790, even in this overclocked Sapphire version. It's a closer call with the 2GB version of the HD 7850, though, with its Pitcairn Pro GPU. On the whole, the Boost has the performance lead, but admittedly only by a small margin. The HD 7850 2GB does have a small edge in our *DiRT*, *Max Payne* and *Sleeping Dogs* tests.

GIVE IT A BOOST

The slightly more expensive HD 7850 2GB boasts generally higher minimum frame rate counts, which is arguably as important as the overall average frame rate. The serious dips in performance are where you really notice gaming performance – you can cope with slightly slower average frame rates if they're consistent, but if they're dropping far below the average then it can be very noticeable. The HD 7790 also has some higher minimum frame rates, but for the most part they're around the same count as the Boost.

The Boost has one more trick up its sleeve and that's SLI. Because it's based on the same PCB as the GTX 660, it has the same SLI capabilities. In our multi-GPU testing of these cards, this makes the GTX 650 Ti Boost a great SLI option. For less than $500 a pair these Nvidia cards will give you some serious top-end performance, easily outclassing the single-GPU performance of the GTX 670 and HD 7950. That said, the HD 7870 XT in CrossFireX pairing will only cost another $80 or so and delivers better performance.

Still, Nvidia's really got its groove back in the volume segment. At the sub-$150 level, AMD's HD 7770 still bests the GTX 650, but from there up to the $260 HD 7870 XT, it's all about the suddenly impressive GTX 650 Ti Boost. AMD seems to have shot itself in the foot with the release of the HD 7790 and its killing off of the HD 7850 1GB card, but that has simply played into Nvidia's hands and its engineers have stepped in the right direction with the benefits offered by the Boost.

Dave James

ALL YOU NEED TO KNOW ABOUT THE KILLER CHIP FOR WIN 8.1

Intel's fourth-generation Core-series processor is about to hit the market. Darren Yates peers inside the silicon to see what the new Haswell platform brings.

Haswell is a small country town in the US state of Colorado. Its entry into the IT lexicon, due to Intel's determination to avoid trademark issues by using location names instead, appears at a critical time in the computing landscape.

With Microsoft's collection of Windows 8 hybrids, convertibles and all-in-ones failing to excite, and with growing evidence that consumers are switching off PCs and laptops in favour of tablets, it's no longer a question of Intel versus AMD, but the PC versus everything else.

As chip design rival ARM skyrockets to bigger profits on the back of booming portable device sales, Intel needs to not only take PC performance to a new level, but show that the platform is still relevant in what's increasingly a portable connected world.

The upcoming fourth-generation Core-series platform continues the Intel biennial 'tick/tock' tradition where the tick delivers the first of a process node and the following tock unleashes new features and performance on that scale. Haswell will piggyback on Ivy Bridge's 22-nanometre (nm) production process but includes new tech, new processor sockets and new performance – as well as new issues.

THE PLATFORM

Haswell isn't just a new series of desktop CPUs – it will permeate into laptops, tablets, workstations and servers. The desktop might traditionally be the first place a new processor series is spruiked, but in this portable and power-conscious era, Haswell's low-power performance will be as important as its desktop and server speed.

The competition Intel is feeling from ARM, particularly in the mobile and server space, is immense so the need to address power consumption is already seeing the chip giant offer news that some Haswell CPUs could use as little as 100mW of power in idle mode. That compares with the 3W minimum with Ivy Bridge. This scale of reduction could see impressive idle battery life coming from tablets and ultrabooks – possibly enough to rival the iPad. Indeed, Intel is spruiking the possibility of 9 hours-plus battery life at idle. But rumours are that Microsoft's up-coming Windows Blue (Windows 8.1) will also play a major role in achieving that 9-hours-plus, thanks to a new power management model that ties into some of Haswell's new power states. Blue is expected to help older systems improve battery life too, but it'll be Haswell that gains the most from the new OS release.

On the desktop, the Haswell Core architecture will come with the same number of cores and identical clock speeds as Ivy Bridge, topped off by the unlocked quad-core Core i7-4770K processor. However, extensions such as Haswell New Instructions (HNI) are expected to boost clock-for-clock performance by a moderate 10%.

In the workstation/server environment, Haswell will appear as the Xeon 3 series of CPUs, first in the workstation-grade E3 models mid-year. And in a further nod to its battle in the low-power server market, the company has also revealed that some Haswell Xeon E3 chips will have a thermal design power (TDP) rating of just 13W. It won't just be the server market interested in low TDPs – Haswell is said to be the first CPU platform designed with tablets and ultrabooks in mind and word is filtering through that some parts will have TDPs as little as 10W.

THE GPU

Just as significant for the PC is the new Haswell integrated graphics processing unit (iGPU). Although there will be four variants of HD graphics available in Haswell, the top-drawer GT3 GPU with 40 execution engines (EUs) on board is expected to turn heads. Appearing as the new HD 5200 series, the GT3 offers up to double the performance of Ivy Bridge's HD 4000 GPU, not only making it a usable gaming solution at higher resolutions, but also boosting its credentials in a GPGPU computing role by adding OpenGL 4.0 and OpenCL 1.2 language support.

The new iGPU also features expanded resolution support for new 4K (4,096 x 2,160-pixel) monitors/TVs and multi-monitor users haven't been forgotten either. New Haswell systems (desktop and laptop) will support up to three simultaneous displays natively in what Intel calls its new Collage Display Mode. Users will also have the option of daisy-chaining monitors on the new DisplayPort 1.2 bus.

There are also improvements to Intel's Quick Sync, its iGPU parallel-encoding technology, which now has open-source support through the Intel Media SDK. The chip giant has also improved hardware acceleration for MPEG-2 and new scalable video coding (SVC), and added support for 4K video resolution hardware encoding.

THE CHIPSET

Haswell's chipset partner in crime will be the Series 8, codenamed Lynx Point. Part numbers will effectively be speed bumps over previous-generation Panther Point offerings with the Z87, H87 and H81 replacing the Z77, H77 and H61. Business-focused systems get new Q87, Q85 and B85 models replacing the Q77, Q75 and B75 chipsets, respectively.

One of the more significant new features is the arrival of Thunderbolt,

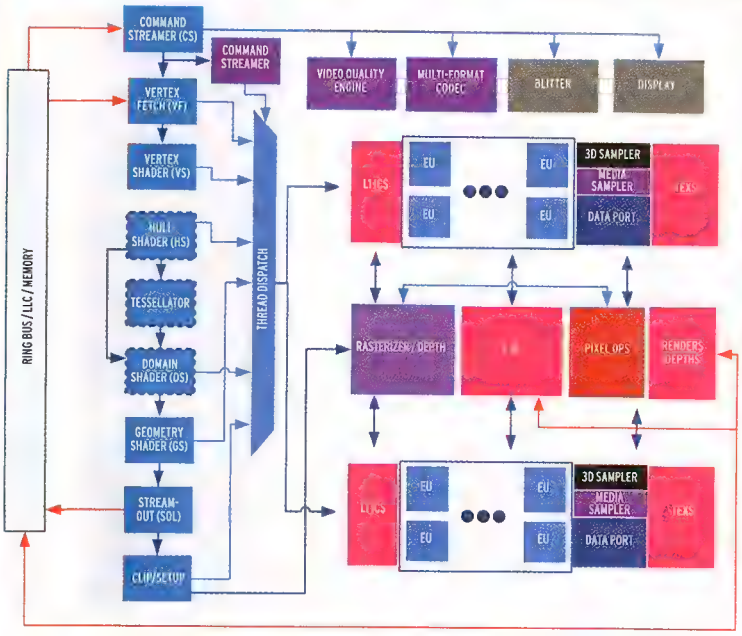
UPCOMING: NEXT-GEN INTEL XEON PROCESSOR E3 FAMILY HASWELL

MID 2013

As low as 13W TDP on 22nm
Integrated graphics for video workloads
Media software developer kits: Available for Linux and Windows in 2013

While Xeon will mostly be Ivy Bridge at the high end, entry-level E3 will get a Haswell makeover.

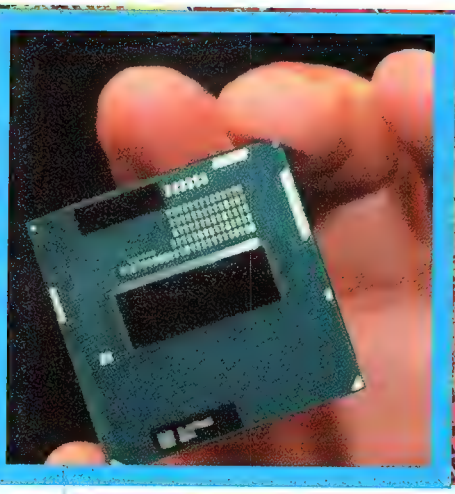
WHAT'S NEXT? 2013 HASWELL ARCHITECTURE



4th-generation Intel Core processor graphics

- Adds support of latest APIs
  - Microsoft DirectX 11.1
  - OpenCL 1.2
  - OpenGL 4.0
- Maintains similar uArch Partitioning to 3rd-generation Intel Core processor graphics

HASWELL PERFORMANCE ENABLES NEW SEGMENTS AND MAXIMUM PERFORMANCE/WATT

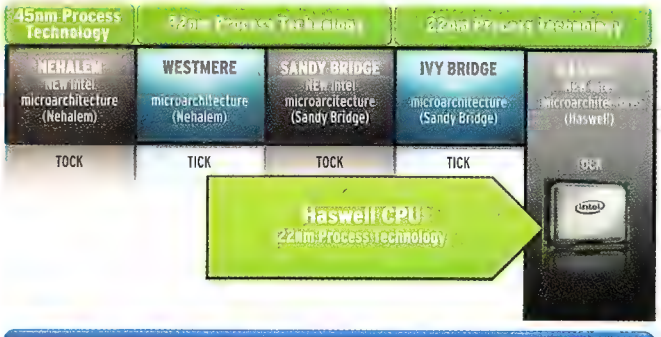


Intel hasn't counted the transistors for us yet, but expect more than Ivy Bridge's 1.4 billion.

Expect Haswell's iGPU to deliver competitive gaming performance.

Tick, tock: Intel's biennial CPU development model.

TICK/TOCK DEVELOPMENT MODEL



HASWELL BUILDS UPON INNOVATIONS IN THE 2ND- AND 3RD-GENERATION INTEL CORE I3/I5/I7 PROCESSORS (SANDY BRIDGE AND IVY BRIDGE)

the previously Apple-only dual serial/DisplayPort bus that delivers data transfer speeds of 10Gbps, twice that of USB 3.0.

Thunderbolt already exists in selected high-end Z77-chipset boards such as the Gigabyte GA-Z77X-UP5 TH using Intel's DSL3510L Cactus Ridge 4C chip. It's expected to permeate through most (if not all) Lynx Point members. That said, you can expect to see these speeds double over the next year: Intel is working with the USB Implementers Forum to double USB 3.0 to 10Gbps over short distances (less than 1m unbuffered) and new Falcon Ridge chips are being developed to double Thunderbolt speeds to 20Gbps.

Another improvement will be for all SATA ports on the new chipset to move from a mixture of SATA 3Gbps/SATA 6Gbps to all SATA 6Gbps. However, the total number of chipset-provided SATA ports will remain at six. As a result, you'll still likely see most motherboard manufacturers supplement this on enthusiast boards with third-party solutions.

THE BUG

Unfortunately, Lynx Point will follow the tradition of Sandy Bridge's Cougar Point chipset with the discovery of what Intel is calling an 'errata' – what we'd call an old-fashioned bug. Confirmed to *APC* by Intel in early April, the 'USB 3.0 bug', as it's being dubbed, rears whenever the system powers down into an S3/U3 sleep state, with some USB 3.0-connected flash drives disappearing from the system. While Intel claims there's no chance of data loss, it's nevertheless raising a replacement for almost the entire Lynx Point chipset range, including server and mobile parts, but these replacements won't be ready until mid-July at the earliest.

Haswell and Lynx Point parts have been hardware partners since early March, but rather than wait for the replacements, Intel has decided the bug isn't serious enough to delay its launch and Haswell will appear with the bug-affected chipsets when it's released, expected to be in the first week of June. You can read more at **tinyurl.com/dx5bnn4**. The errata notification also provides the most complete look yet at the chipsets to become available for Haswell CPUs.

THE FUTURE

As demand for cloud computing shows no signs of abating, the need for reduced power consumption parts will play as much of a role as improved performance for Haswell, particularly in light of the surge of competition from rival ARM processors. Contrary to popular opinion, the desktop PC/laptop market isn't disappearing any time soon. But as computing becomes more decentralised into the cloud and portable devices, Intel will need to ensure that it covers all the bases equally well with its future CPUs. Haswell is Intel's first major release to show whether it can handle the needs of a much broader computing environment.

THE HASWELL CPU: HOW IT WORKS

Intel's latest processor generation has to cover everything from tablets to servers. Darren Yates looks into the new architecture and what we can expect from the different platforms.

At the time of writing, Intel is expected to launch Haswell in early June this year with CPUs in the desktop, mobile and entry- level server markets. It'll be a continuation of the previous-generation Ivy Bridge's 22nm production process with changes across the three key areas: core CPU performance, iGPU improvements and power consumption reductions. We've included tables here covering information on the specific CPU models we've found, so rather than talk about specific chips, we'll look at the architecture and mention any CPU models as necessary along the way.

LOW-LEVEL CACHE BANDWIDTH

Haswell features the same low-level cache amounts as Ivy Bridge – a 32KB instruction/32KB data L1 cache and a 256KB unified L2 cache that can be accessed by all cores. The main difference over Sandy Bridge/Ivy Bridge is the bandwidth, which doubles the number of bytes loaded and stored per clock cycle from 32 and 16, to 64 and 32, respectively. The inter-cache bandwidth also jumps from 32 bytes per cycle to 64 bytes.

What we used to call L3 cache is now known as last-level cache (LLC). While it's not a unified cache like the L2, Intel says it scales according to the number of cores in operation, which basically means it simply switches on as each core does.

ADVANCED VECTOR EXTENSIONS 2

From an instruction viewpoint, today's x86 CPUs are barely recognisable from the Pentium 4 chips we had 10 or so years ago, thanks in part to the continual evolution in instruction extensions (SSE, SSSE, SIMD and so on) added to wider and wider instruction paths. While there's growing interest in parallel GPU computing, Intel continues to persist with CPU-only improvements, adding Advanced Vector Extensions 2 (AVX2) to the Haswell architecture. AVX2 delivers features including 256-bit integer vectors and fused multiply-add (FMA), which means it calculates multiply-add operands to full precision before rounding calculations.

This has the effect of doubling single- and double-precision floating point operations (SP FLOPS and DP FLOPS) per clock cycle over the Sandy Bridge/Ivy Bridge architecture from 16 to 32 and from 8 to 16, respectively. Intel expects you to gain the benefit in gaming and high-performance computing applications such as video processing.

OVERCLOCKING

One of the disappointing aspects of the Sandy Bridge/Ivy Bridge era was Intel's decision to unify all discrete system component clocks off the back of a single base clock (BCLK), which removed the fine-grained overclocking control that was the frontside bus (FSB) clock rate on Intel's Nehalem platform. By also locking the multiplier setting on everything other than the premium-priced top-drawer K-series CPUs, overclocking effectively became a rich person's sport overnight.

Intel delivered something of a compromise solution on its high-performance Sandy Bridge-E/LGA2011 platform, which it has repackaged and now added to Haswell.

Like LGA2011, Haswell provides a small +/-5 to 7% BCLK tweak range on what's essentially now a three-speed gearbox called the PEG/DMI Ratio (PDR). PEG stands for PCI Express Graphics and DMI is the Direct Media Interface, the bus that links the northbridge and southbridge sections together.

Those ratios are 1x (5:5), 1.25x (5:4) and 1.66x (5:3). Provided your Haswell CPU allows you to, you can use a combination of these three options to set up an overclock rate. Before you start ripping up the dance floor in unbridled joy, there's some fine print – 'only some processors enable part or all of these features,' says the Intel presentation slide. Some processors? Part of these features? It should be a given that all overclock options are on the table for the unlocked K-series chips. And as a bonus, Intel is also increasing the K-series' allowable core ratio multiplier up from 67 to 80. Throw in the 1.66x PDR, an extra 7% base clock tweak for good luck and in theory, that's a top clock of 14GHz. No-one's saying you'd ever get anywhere near that, but there'll be a few liquid nitrogen hardheads who'll have fun giving the current land speed record of 8.8GHz (an AMD FX-8150) a real nudge.

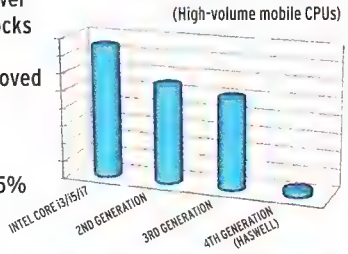
For everything else, we're still in the dark about just how much overclocking non-K chips will allow. If PDR and BCLK settings are locked on everything but K-chips, it's far less interesting since K-chips already have an unlocked multiplier to play with. It'd be like having an everyday car with a single-gear straight-through transmission and a sports car with two manual gearboxes – neither would make much sense.

INTEGRATED VOLTAGE REGULATION

The other half of the overclocking equation is voltage control and here, Haswell gets one of the more significant changes in CPU history. Up until

MAXIMISING BATTERY LIFE

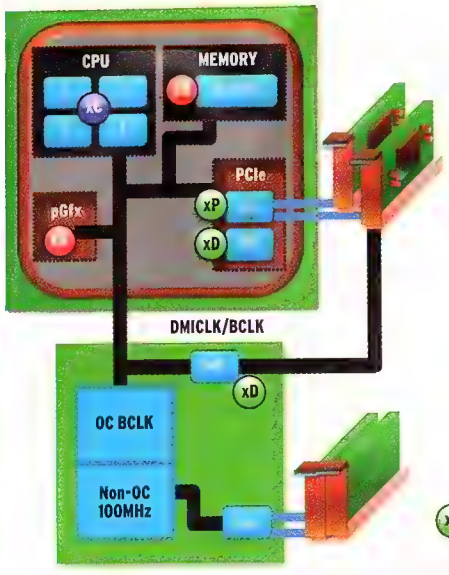
- Deeper idle states, lower active power
  - –Continued focus on turning off blocks that are not required. Example: C7
    - All clocks stopped, voltage removed from the majority of the CPU
    - C7 engaged even when display is active
  - –Faster state transition times by 25%
- Smarter low power states
  - –New S0ix idle states with idle power approaching tablet CPUs
  - –More C-state intelligence
    - System software request
    - Time to next timer event
    - Latency requirements
    - Past history
    - Run time hints from devices



MICROARCHITECTURE, POWER MANAGEMENT AND MANUFACTURING COMBINE FOR 20x REDUCTION IN IDLE POWER

Haswell's new power states will be used by the upcoming Windows 8.1 OS release.

NEXT GENERATION INTEL MICROARCHITECTURE CODENAME HASWELL



CORE FREQUENCY
- –Unlocked Intel Turbo Boost Technology limits*
- –Unlocked core ratios up to 80 in 100MHz increments*
- –Programmable voltage vla IVR

GRAPHICS FREQUENCY (PGFX)
- –Unlocked Intel HD Graphics limits*
- –Unlocked graphics ratios up to 60 in 50MHz increments
- –Programmable voltage vla IVR

MEMORY RATIO
- –Unlocked memory controller
- –Options for 200 and 266MHz steps*
- –Logical ratios up to 2,933MHz*

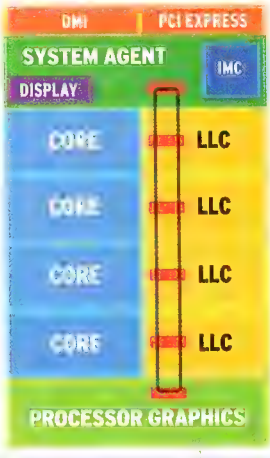
DMICLK (AKA BCLK)
- –Unlocked PCH clock controller (1MHz increments upwards of 200MHz)*

PEG & DMI RATIOS
- –Variable ratios (must reflect selected BCLK frequency)*

*Only some processors enable part or all of these features.

CACHE, INTERCONNECT & SYSTEM AGENT: BACKGROUND

HASWELL BUILDS UPON SANDY BRIDGE'S SCALABLE INTERCONNECT AND SHARED CACHE
- Unidirectional ring with two stops for each core
- Shared Last-Level Cache (LLC) scales with the number of cores
- Processor graphics and system agent have separate ring stops



Sandy Bridge-E/LGA2011 overclocking comes to Haswell, but which chips?

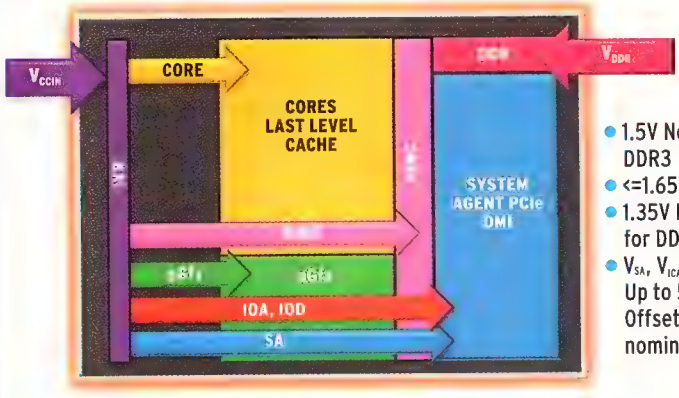
Haswell's LLC isn't unified, but scales with the number of cores in use.

now, you've probably seen the small heatsinks that lined the outer rim of the CPU socket. They're voltage regulator modules (VRMs) that deliver precise voltage levels to various parts of the CPU: the cores, the graphics module, memory controller and so on.

For the first time, Haswell integrates those VRMs into the silicon so instead of multiple voltage inputs that you had with Ivy Bridge, Sandy Bridge and every CPU before that, Haswell now has just one called V_{CCIN} (there's another for the DRAM controller, too, but that's another story). You can still overvolt the CPU; in fact, integrated voltage regulation (iVR) makes overvolting more reliable because the physical track distances between the VRMs and the actual CPU circuitry is drastically reduced. Integrating VRMs will add to the CPU's heat load, but you end up not only with a more compact board, the VRMs now get active cooling under the CPU heatsink/fan combo. The main benefit from an overclocking viewpoint is 'cleaner' power. Because the physical VRM layout is no longer at the discretion of motherboard designers and is now buried inside the CPU, you get a much greater consistency of power quality across all systems you couldn't have before.

You can push the cores and other sections up to 2V and V_{CCIN}, which should run around between 1.8 and 2.3V and can go all the way to 3.04V. The bottom line is there are no artificial limitations on voltage control for Haswell overclocking, allowing you to push the chip as far as you have the guts to do so.

NEXT-GENERATION INTEL MICROARCHITECTURE (HASWELL) VOLTAGE PLANES FOR PERFORMANCE TUNING



- 1.5V Nom for DDR3
- <=1.65V for XMP
- 1.35V Nom for DDR3L
- V_{SA}, V_{ICA}, V_{IOD}: Up to 500mV Offset V from nominal

- V_{CCIN}: SVID 1.8V Nom up to 2.3V+, static V up to 3.04V
- V_{CORE}: dynamic additional V, static V up to 2.0V
- V_{RING}: dynamic additional V, static V up to 2.0V
- V_{GT}: dynamic additional V, static V up to 2.0V

Integrating the VRMs inside Haswell silicon will improve overclocking capabilities.

REDUCING POWER CONSUMPTION

In our view, Intel's 'tock' chips are often better than their 'tick' models. Given the amount of work required to implement a new smaller-scale lithographic process, Intel engineers have to spend time just making sure the new scale works. And that's come through here with Intel claiming on Haswell that it has further refined the 22nm process with lower power consumption tri-gate transistors and made better use of its transistor budget per die.

Intel has used a number of standard power reduction techniques in the past that get a run here on Haswell. They include greater voltage/frequency scaling, where the core voltage is reduced in proportion to the CPU clock speed. A lower voltage means lower current, which equals significantly lower power consumption. Another trick CPU designers are increasingly using is what's called gating, whereby unused cores and general processor logic are switched on and off as required. However, the gating mechanism needs to be lightning-quick in order to reduce propagation delays through the processing chain, and integrating the VRMs onto silicon goes a long way to reducing those delays. Even so, gating is a highly effective way of further reducing power consumption.

Haswell extends this further by decoupling each core from the LLC to tweak the power consumption further, calling it a fine-grain control. Microsoft's Windows 8.1 release is rumoured to link in with all of these.

NEW INTEGRATED GPU

You have to imagine Intel engineers also much prefer playing with 'tock' CPUs than 'ticks' as it's here with the 'tock' models they get to add more toys. And one of the big new pressies in Haswell is a vastly improved iGPU. In fact, there'll be four variants: GT1, GT2, GT3 and GT3e. The GT3/3e (GT3e includes embedded DRAM) options will be known as the HD 5100/5200 and deliver 40 EUs. By comparison, Ivy Bridge's HD 4000 had just 16 EUs. Disappointingly, though, most of the desktop chips will

only include the GT2 option with its 20 EUs, with one exception: the new R-model desktop chips.

NEW SOCKETS

This is a good time to break into our analysis and look at one of the more controversial side issues of Haswell. The new platform also introduces a number of new sockets, but if it happens as expected, there'll be two package options for the desktop: the standard LGA1150 for the majority of CPUs as well as a BGA/pre-soldered option for the new R-suffixed chips, the only ones that will see the new top-grade GT3 iGPU.

On the back of rumours swirling at the end of last year was one that Intel was about to drop CPU sockets for non-upgradable motherboards. It's worth noting from the tables that while the R-series CPUs may have the best GT3 iGPUs, they're slower/lower-powered parts with 65W TDPs. The Core i7-4770R, Core i5-4670R and i5-4570R parts are well down on clock speed compared with their top family parts. That makes them far more likely to end up in NUC compact mini-ITX boxes or all-in-one PCs, designs where TDPs need to be more carefully managed.

But the obvious question remains: why hasn't Intel provided an LGA1150 option with its best GT3 iGPUs? Our initial guess is heat production. Cramming a 40-EU GT3 iGPU into a Core i7-4770K along with new iVR could see the TDP disappear well over 100W mark. Still, we hope it happens.

iGPU PERFORMANCE

Intel is trying to appeal to everyone, given its new inclusions – DirectX 11.1, OpenGL 4.0 and OpenCL 1.2. AVX2 might give the impression that there's not much interest from Intel in parallel processing, but it'll be interesting to see if Haswell's iGPU now has enough performance to make OpenCL a serious option.

However, the iGPU language additions only tell part of the story. While the GT3/3e is expected to double the performance of the HD 4000, there are significant additions to other capabilities, particularly display and media coding.

Quick Sync is Intel's iGPU-based hardware-accelerated MPEG-2 and AVC encoding. While it offers impressive encoding speed increases, some users have complained the drop in encoding quality made it less palatable. However, the chip giant says it has improved Quick Sync with full hardware encoding as well as adding MJPEG and SVC encoding/decoding acceleration.

The official introduction of Thunderbolt into Lynx Point also means that multi-monitor setups are easier to achieve with a Haswell iGPU. It'll handle up to 4K resolution (4,096 x 2,160 pixels) and up to three independent displays directly connected or possibly more through DisplayPort 'daisy-chaining' or DisplayPort hub.

iGPU POWER CONSUMPTION

All of these tricks are easy to do on the desktop, but if Intel is to make its mark against ARM in the tablet market, it'll need to do much of this with greatly reduced power consumption. It's here that the chip maker is happy to give us an insight into the problems.

Intel says there are two main components of power consumption: dynamic power and what it calls leakage. Dynamic power goes up with clock speed and transistor count and thanks to Ohm's Law, goes up quickly with voltage (power = V^2/R).

However, leakage goes up with transistor counts and occurs regardless of clock speed, but apparently climbs even faster with voltage changes (something approaching V^3). Without going into the circuitry theory, Intel says you obtain your best power efficiency by running the maximum clock speed you can at the lowest voltage ($F_{max}@V_{min}$). That's because once you increase beyond your minimum voltage, power consumption climbs at a faster rate.

Another trick to reduce power demands is moving tasks from general-purpose execution engines to single- or fixed-function hardware (video processing is Intel's example here). It also makes sense – purpose-designed hardware is always more efficient than general-purpose units because you need less transistors, and it's the number of transistors constantly switching that directly affects power consumption.

When it comes to the iGPU's bread and butter – displaying video – Intel uses another technique called 'race to halt'. If you're displaying video that requires a fixed frame rate, there's no benefit in displaying it at a higher rate, especially to power consumption. So Intel engineers use the idea of race to halt, which means maintaining the $F_{max}@V_{min}$ performance level and switching off for micro-sleeps as soon as that required frame rate is achieved. The other alternative is to drop the video iGPU clock rate to a just enough level, but Intel says that's not as efficient as maintaining $F_{max}@V_{min}$ performance and micro-sleeping.

This is an important concept because there's a general view that you can achieve lower device power consumption by simply dropping the CPU clock frequency and running at slower rate. What Intel is saying is that because of quiescent power draw (power used simply because transistors are there), there's a better return if you stick to your most efficient clock rate and micro-sleep when you meet your time-dependent requirements.

You can be sure Intel doesn't have a monopoly on these techniques – AMD and ARM will be using similar technology to reduce power consumption; in fact, the Cortex-M3, one of ARM's smaller CPUs aimed at embedded applications, already has iVR. Doing it on a CPU the scale of Haswell is something different again, but it's still worth understanding how CPU/iGPU power consumption can be optimised.

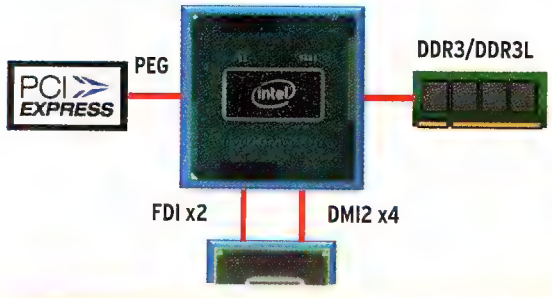
The one interesting side note to all of this, however, has been the increase in TDPs of the top-performing parts such as the Core i7-4770K and i5-4670K, up from 77W to 84W compared with their Ivy Bridge equivalents. That's led to speculation that Haswell won't have the power reductions Intel is claiming, something the chip maker vigourously denies. Given the VRMs are now integrated, TDPs will naturally go up, although on the other side of the ledger, Intel would also gain elsewhere through improved efficiencies. Those improvements will have to shine through, particularly on the ULV parts if we're to see anything like 9 hours-plus battery life. That said, you don't need to go to ULV parts to see the benefits – look at the T-series desktop LGA1150 options that offer full core/thread counts at slightly lower clock speeds, but with impressive 45W and even 35W TDPs.

WHAT'S NEXT?

In the enterprise arena, power consumption matters as much as performance, so expect to see even greater levels of integration and more system on a chip (SoC) designs in the coming years.

Haswell isn't the only show for Intel for 2013. The chip maker will launch Ivy Bridge-EP (Xeon E5) and EX (Xeon E7) server chips later this year. You can also expect to hear quite a bit about Avoton, the next-generation 64-bit Atom CPU. Atom might be a dead loss on the desktop but it will compete hard against ARM in the burgeoning microserver market. Avoton is being built using the same 22nm process as Haswell and with 64-bit instructions, Intel no doubt believes it'll offer more features than ARM can deliver right now.

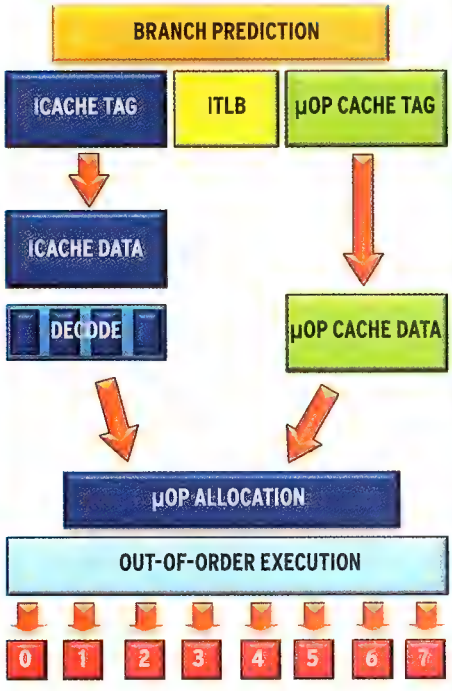
HASWELL-ULT SYSTEM AGENT



	Memory I/F	PCI Express	DMI	OPI
Haswell	DDR3/DDR3L at 1,333/1,600	Gen3	Gen2 x4	x
Haswell-ULT	DDR3L/LPDDR3 at 1,333/1,600	x	x	x8

Improved branch prediction can help cut down wasted instructions.

HASWELL CORE AT A GLANCE



Next-generation branch prediction
- Improves performance and saves wasted work

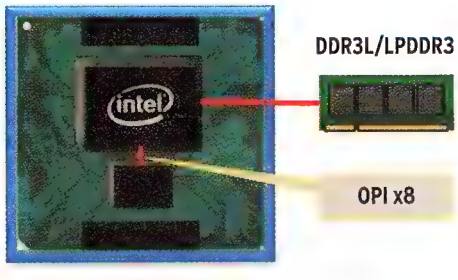
Improved front end
- Initiate TLB and cache misses speculatively
- Handle cache misses in parallel to hide latency
- Leverage improved branch prediction

Deeper buffers
- Extract more instruction parallelism
- More resources when running a single thread

More execution units, shorter latencies
- Power down when not in use

More load/store bandwidth
- Better prefetching, better cache line split latency and throughput, double L2 bandwidth
- New modes save power without losing performance

CHANGE OVERVIEW



The ULT version of Haswell integrates even PCIe onto the chip silicon.

HASWELL CPUs: DESKTOP

Family	Model	Core/thread count	CPU clock – normal/ turbo (GHz)	L3 cache (MB)	TDP (watts)	Haswell iGP model	IGP – turbo (MHz)	Socket
Core i7	4770K	4/8	3.5/3.9	8	84	GT2	1,250	LGA1150
	4770	4/8	3.4/3.9	8	84	GT2	1,200	LGA1150
	4770S	4/8	3.1/3.8	8	65	GT2	1,200	LGA1150
	4770R	4/8	3.2/3.9	6	65	GT3	1,300	BGA
	4770T	4/8	2.5/3.7	8	45	GT2	1,200	LGA1150
	4765T	4/8	2.0/3.0	8	35	GT2	1,200	LGA1150
Core i5	4670K	4/4	3.4/3.8	6	84	GT2	1,200	LGA1150
	4670	4/4	3.4/3.8	6	84	GT2	1,200	LGA1150
	4670S	4/4	3.1/3.8	6	65	GT2	1,200	LGA1150
	4670R	4/4	3.0/3.7	4	65	GT3	1,300	BGA
	4670T	4/4	2.3/3.3	6	45	GT2	1,200	LGA1150
	4570	4/4	3.2/3.6	6	84	GT2	1,150	LGA1150
	4570S	4/4	2.9/3.6	6	65	GT2	1,150	LGA1150
	4570R	4/4	2.7/3.2	4	65	GT3	1,150	BGA
	4570T	2/4	2.9/3.6	4	35	GT2	1,150	LGA1150
	4330	4/4	3.0/3.2	6	84	GT2	1,100	LGA1150
	4330S	4/4	2.7/3.2	6	65	GT2	1,100	LGA1150

HASWELL CPUs: MOBILE

Family	Model	Core/thread count	CPU clock – normal/ turbo (GHz)	L3 cache (MB)	TDP (watts)	iGP model	IGP – turbo (MHz)
Core i7	4930MX	4/8	3.0/3.9	8	57	GT2 (HD 4600)	1,350
	4950HQ	4/8	2.4/3.6	6	47	GT3e (HD 5200)	1,300
	4900MQ	4/8	2.8/3.8	8	47	GT2 (HD 4600)	1,300
	4850HQ	4/8	2.3/3.5	6	47	GT3e (HD 5200)	1,300
	4800MQ	4/8	2.7/3.7	6	47	GT2 (HD 4600)	1,300

HASWELL CPUs: SERVER

Family	Model	Core/thread count	CPU clock – normal/ turbo (GHz)	L3 cache (MB)	TDP (watts)	iGP model	Socket
Xeon E3	1285 V3	4/8	3.6/4.0	8	84	GT2 (HD P4600)	LGA1150
	1285L V3	4/8	3.1/3.9	8	65	GT2 (HD P4600)	LGA1150
	1280 V3	4/8	3.6/4.0	8	82	None	LGA1150
	1275 V3	4/8	3.5/3.9	8	84	GT2 (HD P4600)	LGA1150
	1270 V3	4/8	3.5/3.9	8	80	None	LGA1150
	1265L V3	4/8	2.5/3.7	8	45	Unknown	LGA1150
	1245 V3	4/8	3.4/3.8	8	84	GT2 (HD P4600)	LGA1150
	1240 V3	4/8	3.4/3.8	8	80	None	LGA1150
	1230 V3	4/8	3.3/3.7	8	80	None	LGA1150
	1230L V3	2/4	1.8/2.8	4	25	None	LGA1150
	1225 V3	4/4	3.2/3.6	8	84	GT2 (HD P4600)	LGA1150
	1220 V3	4/4	3.1/3.5	8	80	None	LGA1150
	1220L V3	2/4	1.6/2.3	4	16	None	LGA1150

HASWELL'S LYNX POINT CHIPSET

It has better integration with the Intel/Apple-designed Thunderbolt interface, but what else do we know about Intel's next chipset series? Darren Yates investigates.

The Haswell CPU platform will be accompanied by a new Series-8 chipset, otherwise known as the platform controller hub (PCH), codenamed Lynx Point. This will initially include the Z87 and H87 parts aimed at enthusiasts and mainstream system builds, respectively, followed by a budget H81 chipset to replace the old H61 model later in 2013. Enterprise users will gain access to the Q87, Q85 and B85 chipsets, replacing the Q77, Q75 and B75 Ivy Bridge components.

While there was plenty of talk about Haswell, its new features and changes at the recent Beijing IDF conference in April, we couldn't find any specific presentations covering the chipset. Whether this was because Intel didn't want to talk specifics or as a result of the discovery of a problem with Lynx Point's USB 3.0 power cycling is unclear.

THE USB 3.0 BUG

What's clear is that a problem exists. *APC* received confirmation from Intel of the bug in early April. Essentially, all initial Lynx Point chipsets have a problem when the USB 3.0 ports are put into an S3 sleep state while attached to certain USB flash drives. The drive enumeration is lost and the drive disappears when the system is brought back from the S3 state. Still, Intel claims there's no possible loss of data or corruption.

The solution is apparently simple enough – you remove and reinsert the drive. According to the official statement, the company says the problem appears with only a few USB 3.0 flash drives so far. However, the Product Correction Notice (PCN) issued on April 4 this year makes it clear that the problem can't be fixed through software and requires a new C2-stepping of all Series-8 chipsets.

Still, somewhat surprisingly, Intel and its partners have decided that the problem isn't serious enough to derail the launch of Haswell in early June, as new C2-stepping chipsets won't be available from Intel until July 15 at the earliest. So it means that initial Haswell products – motherboards and portable devices – will ship with this fault.

The last time Intel had a major chipset fault was with Sandy Bridge's Cougar Point release, where design problems with the chipset's SATA 3Gbps ports caused performance on them to degrade significantly over time. The cost of delaying the Sandy Bridge release, creating the B3-stepping chipset fix and rectifying the problem on that occasion totalled US$1 billion.

According to the new PCN, Intel will simply run down inventory of C1-stepping parts before eventually swapping to C2 by July 31 at the latest. With hardware partners told that full electrical regression testing won't be necessary and that the C2-stepping is pin-for-pin compatible with C1, the changes look to be quite minor, but just annoying enough to require a full chipset stepping.

INTEL'S OFFICIAL STATEMENT TO *APC*

"Fourth-generation Core is on track for a mid-year launch. Intel issued a PCN documenting a chipset USB errata and stating that chipsets with the errata will be in production during the initial ramp. But Intel has confirmed that there is no chance of a data loss or corruption. This issue has only been observed with a small subset of USB SuperSpeed thumb drives and does not affect other USB peripherals. We take all customer issues seriously and should any customer have a question or concern, they can always contact Intel customer support."

WHAT SHOULD YOU DO?

Given that Intel has had to introduce a new chipset stepping to fix the problem, along with its decision not to wait for the fix before launching Haswell, we see no other alternative but to recommend that you don't purchase initial launch Haswell systems or products.

Had the bug been solvable by a software fix, it'd be far less of an issue. Given the timeline of replacement chipsets, it's unlikely we'll see C2-stepping product hit the streets in volume before the end of August. Even so, we don't see the point of purchasing bug-affected products given that replacements will be only a couple of months away.

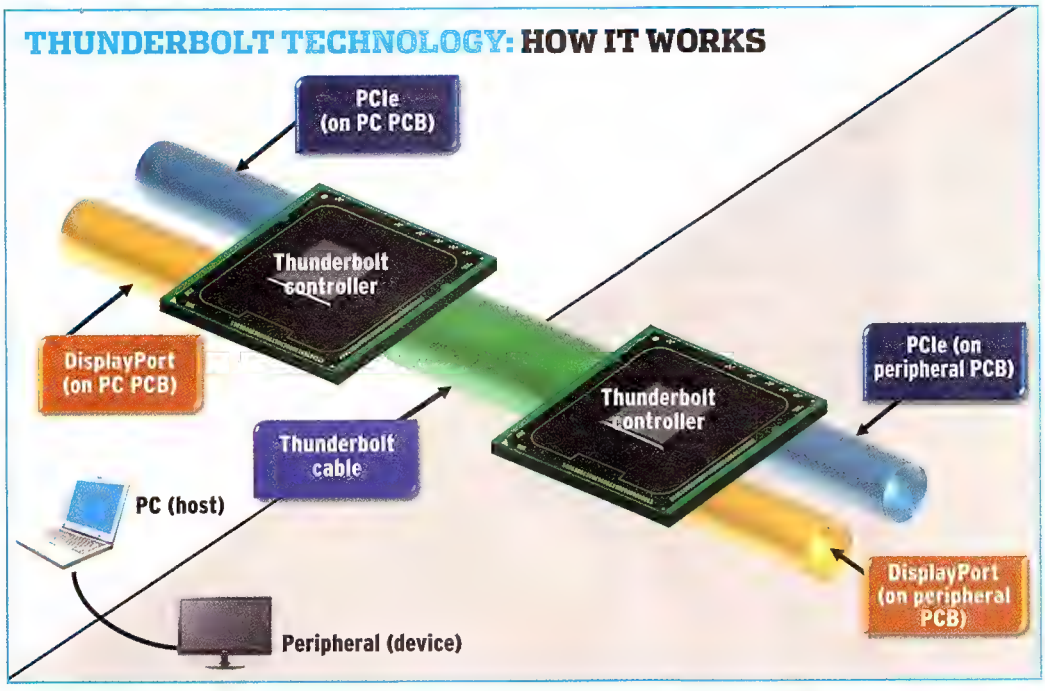
All launch chipsets have the problem – the desktop DH82Q87, Q85, H87, Z87 and B85 parts, workstation/server chipsets DH82C222, C224, C226 plus the mobile DH82QM87, HM87 and HM86. You can download the PCN at **tinyurl.com/dx5bnn4**. Further, it means to ensure you don't end up with affected products, you'll need to confirm with your supplier that the parts and devices you receive have the C2-stepping chipsets.

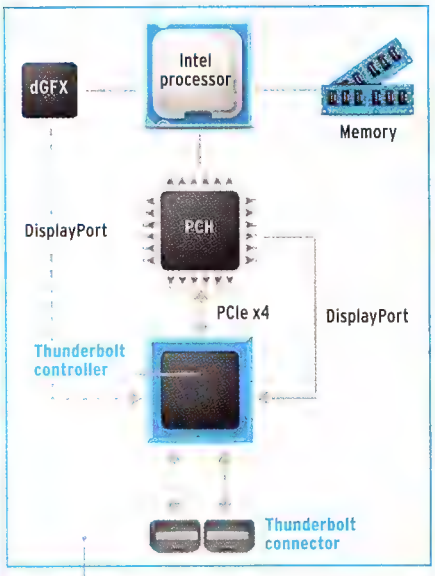
At the time of the Cougar Point/SATA 3Gbps problem, most motherboard manufacturers plastered 'B3-stepping' all over new motherboard boxes or incorporated the B3 into new board model numbers. It's very likely you'll see a round of C2 boards hitting the streets towards the end of August. However, identification will be more problematic with portable devices, so you'll need to get your supplier to swear on a stack of databooks that you're getting bug-fixed C2 parts.

MOTHERBOARDS

Already, Gigabyte is showing off new motherboards including the tiny mini-ITX form factor GA-Z87N-WIFI, aimed at the home theatre market, the mainstream GA-H87-D3H with its two-way CrossFire gaming, the B85-HD3 for business and the GA-Z87X-D3H targeting the gaming enthusiast. As usual, the boards feature solid capacitors, two-ounce copper PCB tracks and solid ferrite cores. This comes on top of other boards including its flagship GA-Z87X-OC plus other high-performance boards such as the GA-Z87X-UD5H. ASUS has so far only teased its Haswell gear, with shots of its Z87 Deluxe and Gryphon Z87 RoG enthusiast boards.

Thunderbolt is driven by new DSL4510/4410 controllers for Haswell.





A simplified diagram of how Thunderbolt links with the CPU and PCH.

Intel announced earlier this year that it was winding down its own motherboard manufacturing business upon the release of Haswell; its flagship DZ87KLT-75K board, on show at IDF Beijing, could be one of its last. The company said it would begin moving its resources from boards into new form factor designs, including desktop and mobile products.

NEW FEATURES

It's expected that Intel will finally move all SATA ports on its Lynx Point PCH over to SATA 6Gbps – just don't expect to see any more than the standard six count. For most of us, though, that'll likely be enough. High-performance motherboards will supplement that with third-party controllers adding up to 10 or more.

As Intel continues to integrate more peripheral features like iVR onto the CPU, the PCH will continue to take on a lesser importance. However, one of the new features you'll see extend to the motherboard is DisplayPort. Intel's iGPUs have the ability to handle three digital video ports: HDMI, DVI and now DisplayPort.

DisplayPort may also be tied up with Thunderbolt, the Apple/Intel dual-purpose serial/DisplayPort bus. Thunderbolt appeared in a few new high-end Z77-chipset boards, thanks largely to incorporating Intel DSL3510L controller chips onto the boards. Intel recently announced new Redwood Ridge DSL4510/4410 controllers that will tie in with Haswell CPUs. The DSL4510 incorporates DisplayPort 1.2 specifications.

We think it'll work like this: the iGPU will handle the DisplayPort 1.2 video output, which will be passed onto the DSL Thunderbolt controllers and onto the Thunderbolt bus if it's implemented by the board maker.

CHANGES

Apart from Thunderbolt, it's unlikely there'll be any other new features you won't have already seen in Ivy Bridge motherboards, apart from the new LGA1150 and BGA sockets, of course. The only other newish option is what's being called thin mini-ITX, where a lower-profile back panel port layout will result in a flatter motherboard, suitable for use in more compact cases and all-in-one chassis.

WORTH THE WAIT?

Buying a chipset with a bug isn't something that should appeal to many users – it doesn't to us. We think it's unfortunate Intel didn't catch the problem earlier to avoid the situation of consumers buying affected hardware, however slight Intel decides the bug may be. If it can match the iGPU performance and power consumption rhetoric with real-world results, Haswell should continue to support the argument of why upgrading with each new 'tock' CPU platform is the best strategy.

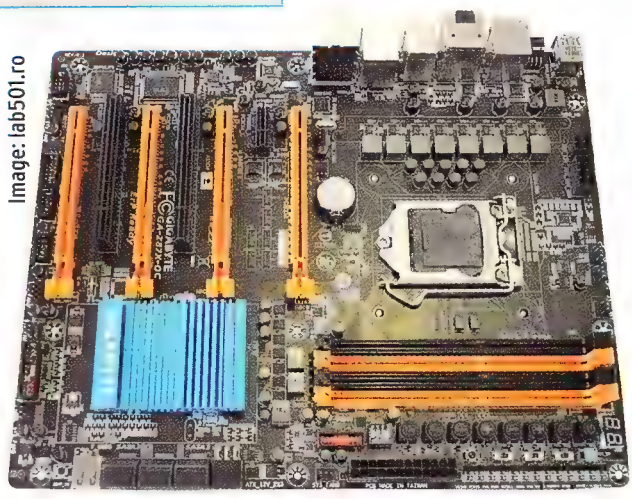
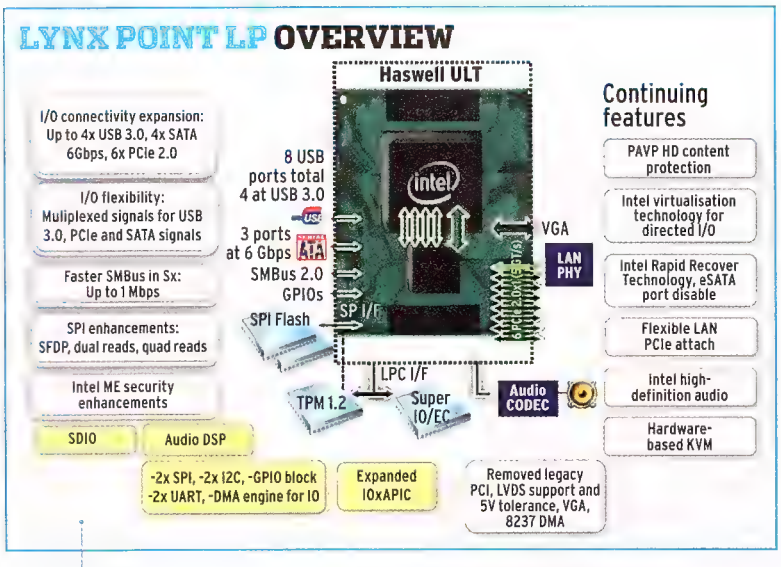


Image: lab501.ro

Note the lack of heatsinks around the CPU on this leaked image of Gigabyte's GA-Z87X-OC board.


LYNX POINT LP OVERVIEW
Haswell ULT
I/O connectivity expansion: Up to 4x USB 3.0, 4x SATA 6Gbps, 6x PCIe 2.0
I/O flexibility: Muliplexed signals for USB 3.0, PCIe and SATA signals
Faster SMBus in Sx: Up to 1 Mbps
SPI enhancements: SFDP, dual reads, quad reads
Intel ME security enhancements
SDIO
Audio DSP
8 USB ports total 4 at USB 3.0
3 ports at 6 Gbps
SMBus 2.0
GPIOs
SPI Flash
SP I/F
LPC I/F
TPM 1.2
Super IO/EC
VGA
LAN PHY
Audio CODEC
-2x SPI, -2x I2C, -GPIO block -2x UART, -DMA engine for IO
Expanded IOxAPIC
Removed legacy PCI, LVDS support and 5V tolerance, VGA, 8237 DMA
Continuing features
PAVP HD content protection
Intel virtualisation technology for directed I/O
Intel Rapid Recover Technology, eSATA port disable
Flexible LAN PCIe attach
Intel high-definition audio
Hardware-based KVM

This leaked slide shows how Lynx Point should make it into ultrabooks.

THE FUTURE OF THE PC

What does Haswell mean for the future of the computer? Darren Yates discusses where it's headed, based on what he's learnt from Intel's fourth-generation Core platform.

The PC isn't dying, but you'd have to say it's not doing too well. That's the message from the recent first-quarter 2013 global PC shipment figures from market analyst IDC. Compared with the same period in 2012, this year's first-quarter figures were down nearly 14%, the largest drop in history and IDC has no qualms about who's to blame.

"At this point, unfortunately, it seems clear that the Windows 8 launch not only failed to provide a positive boost to the PC market, but appears to have slowed the market," said Bob O'Donnell, IDC Program Vice President, Clients and Displays. "While some consumers appreciate the new form factors and touch capabilities of Windows 8, the radical changes to the UI, removal of the familiar 'Start' button and the costs associated with touch have made PCs a less attractive alternative to dedicated tablets and other competitive devices. Microsoft will have to make some very tough decisions moving forward if it wants to help reinvigorate the PC market."

Ouch. Locally, the drop in our neck of the woods (Asia Pacific) came in at 12.7% year on year, the first time our region has seen a double-digit slump. All PC brands went backwards, with Acer recording an extraordinary 31.3% crash in global sales.

However, the important question is, where does the PC go from here? Does it have a future or will we all be wistfully remembering the good, old days as we communicate on the **apcmag.com** web site with our tablets and smartphones?

THE WINTEL PROBLEM

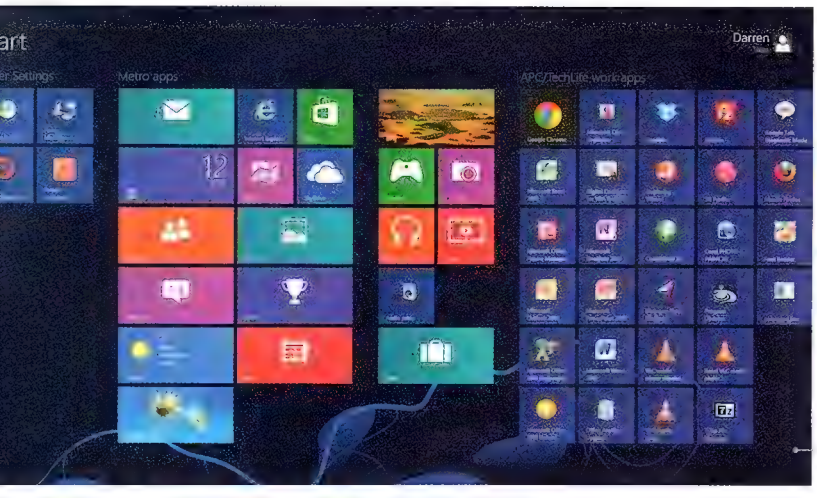
If the 1990s/2000s IT landscape was characterised by anything, it was the Wintel alliance – the unbeatable combination of Microsoft's Windows operating system and Intel's CPU technology, which saw PC sales skyrocket. While neither would have seriously minded their rising successes being tied to the other, you can bet they're not as happy as they start coming down the other side.

From the hardware side of things, Intel has managed to deliver a reasonably stable platform with regular improvements for much of the last 20 years. Despite having some excellent silicon, AMD unfortunately has been largely neutered as serious competition. Intel's massive marketing budget certainly wouldn't have helped.

Aside from some excellent new features in Microsoft's latest OS, IDC has effectively said Windows 8 has been an 'own goal' for the PC market and even helped accelerate the take-up of smartphones and tablets, a market that's completely owned by Intel rival ARM.

Does that mean Intel can blame everyone else for the slump the PC is in right now? Of course not – Intel has to shoulder a significant proportion of the blame for doing too little to innovate elsewhere.

If you step back and look at the big picture, you can see how market pressure is driving the chip giant. Intel is now as much concerned with performance as it is power consumption. Reduced power consumption computing (RPCC) undergirds just about everything in the mobile and server space right now. You can't read about a new server processor release without hearing about its low TDP, or a new mobile quad-core-powered device without debate about its battery life. Combine all of this together and you get a pretty fair idea of where the PC as a platform is headed for the next few years.



Windows 8 is taking the blame for the slowdown in PC sales.

DESKTOPS

Continued process node reductions have enabled CPU makers to take more and more features off the motherboard and squeeze them inside the processor itself. Memory controllers, voltage regulators, graphics processing units, even the North Bridge itself now exist only as CPU silicon. That, along with continued miniaturisation, has seen Intel develop the NUC design, which we showed you earlier in the year.

Reducing the desktop computer to little more than a stack of half-a-dozen CD cases in size while at the same time reducing power consumption is where Intel expects the consumer and enterprise desktop to end up. All-in-one designs have grown considerably in the last five years and Intel still sees growth for business and consumer versions in the coming period.

So where does that leave PC gaming? The market reality is that the current PC form factor will continue while ever there are consumers coughing up sufficient cash to keep the discrete component industry afloat. The growing sophistication and lower cost of gaming consoles, let alone the boom in tablet gaming, will continue to put pressure on PC gaming hardware prices.

That will mean further cost reductions and as queasy as it makes us feel, it's very likely more PGA/pre-soldered desktop CPUs like the Core i7-4770R are on the cards rather than less. That Intel has only given the LGA socket qualified support until 2015 further suggests an inevitable move is coming.

LAPTOPS

Part of the problem with the PC has been the continual erosion of average selling prices. It's been acknowledged as part of AMD's larger financial woes and it's affecting laptop sales. The one laptop platform where there is still hope is ultrabooks. The ultra-compact designs sell

Intel is pushing the all-in-one design where it still expects to see growth.

If you can't beat 'em: ultrabook convertibles like this Lenovo will take on the tablet market with Haswell.

for more than standard laptops and Intel said at its September 2012 IDF conference that it expected there to be around 140 ultrabook designs by the time Haswell launches in June.

The key aspect involving Haswell here is that Intel is claiming the new CPU will be the first CPU designed specifically for ultrabooks, with TDP options down to as low as 10W.

Intel is still churning out quad-core chips for the performance/gaming end of the laptop market, although expect to see the chip giant push hard with ultrabooks and ultrabook convertibles to try and take on the tablet market.

Adding further weight to this view has been our sighting of a long list of upcoming Haswell/ULV processors from the Core i7-4558U to the Core i5-4258U and i5-4200Y, down to the Core i3-4005U, all in combination with the three main new iGPU options: the GT2/HD 4400, GT3/HD 5000 and GT3/ HD 5100.

You'll continue to see budget 15in bricks for the foreseeable future, but it'll be ultrabooks combined with Windows 8.1, delivering excellent performance and true day-long battery life that could well be Wintel's renaissance. Throw in these ULV parts and it might also give ARM something to think about.

AN EVOLVING PLATFORM

It might sound like we're selling a sob story about price erosion, but the reality is that as profits drop, manufacturers look for ways to cut costs. Losing CPU sockets, adding more integration and delivering new platforms are all key factors in keeping the PC market alive. Regardless of where your standpoint is, the PC market simply can't continue to drop sales at the rate of 14% per quarter for too long without change. However, if you look back 10 or more years ago to the Slot-cartridge CPU era, change and integration have been part and parcel of what is always an evolving platform.

Yes, the PC is in trouble, although the reality is that it still delivers a level of performance that tablets and smartphones can only dream of. Combine that with lightweight portable and compact desktop designs plus greatly improved power consumption, and the PC may well change what it looks like, but the platform will still exist for a few more years yet. ABC

Expect to see even more ultrabooks being produced when Haswell arrives.

Intel's NUC, the desktop of the near-future?

Heavy use of mobile parts and integration will drive future desktop development.

TODAY'S PRINTERS

Printing may not get the headlines, but there are many exciting developments in the space. Really. Stephen Withers reports.

Good news: printers are cheaper. Anthony Toope, marketing and channel operations manager at Fuji Xerox Printers, cites IDC research showing price erosion of 15% during 2012. That's good for customers because printers are "more affordable than ever before," he says. But in practice, business customers are going for 'higher value' by selecting models that print faster or have otherwise better specifications rather than saving money.

DISTRIBUTED PRINTING

Toope reports a trend towards distributed printing by businesses, with growing demand for smaller yet still 'workhorse' units rather than high-end models. If that's generally the case, it could mark a significant reversal of the previous tendency to seek savings by consolidating printer fleets – or it may just be that the availability of higher-performance units at comparatively modest prices has seen that trend shift down to the workgroup and small business level.

Jeremy de Silva, product marketing manager at Oki Data, has a slightly more nuanced view: he agrees there's a move back to decentralised printing, but suggests it's driven by the growing demand for MFPs rather than single-function printers – an MFP on the other side of an open-plan office is much more convenient than one down the corridor or on a different floor. He also notes that vendors are still reducing the cost per page for mid-range models and they're becoming competitive with the copier-based models that tend to dominate the high end. Greater convenience at a similar cost is a convincing argument.

A possibly related change is that businesses are increasingly spurning A3 models, according to Stephen Bell, ANZ marketing manager at Lexmark. Less than 2% of output is A3, and A4 printers take up less space and are more energy efficient. So an organisation might use a single A3 printer located wherever it gets the most use, while installing A4 models elsewhere.

FEATURES & SPECIFICATIONS

HOME

The need to print from multiple devices is driving home users towards wireless printers, claims Toope. In 2012, wireless models accounted for 20% of the market and this is expected to increase to 50% in 2013. "Connectivity is now a must," says James Carrick, Canon's product manager of consumer print. But there's no real sign of 802.11ac reaching home printers anytime soon. "Currently, Canon printers are being sufficiently supported by the very competitive 802.11n standard data transfer rate for printing. Canon will look to support our printer ranges with new technological developments such as the 802.11ac wireless standard when it becomes available as a Wi-Fi source," he added. (802.11ac routers have been available in Australia for months.)

The falling prices of colour laser/LED printers are making them more interesting to home users, Toope suggests, noting that a 23ppm duplex colour printer can be purchased for around $400.

Productivity is important for consumer and home office customers, says Bruno Turcato, managing director of Epson Australia. Faster print speed is 'a continuing trend', and he and Carrick both point to a still-widening range of lower-priced models with features such as duplex printing, more paper handling capabilities and automatic document feeding on the scanner. Features that were once the preserve of higher-end devices are now reaching consumer models, observes Turcato, while Carrick notes the return of CD/DVD printing on one of Canon's latest models (the PIXMA MX926), a feature that will be included with some (but not all) of Canon's future consumer printers.

While consumers don't necessarily use all the features from the outset, Turcato suggests it's similar to buying a car: you tend to buy the well-featured product and then begin to take advantage of more and more features as you realise they're there and how they may be useful.

Although inkjet printing has a reputation for being expensive, especially on consumer models, there are moves in the right direction. Canon's latest PIXMA models have the option of large ink cartridges (and extra large for black) and Carrick says they deliver 'significant savings'.

Home and home office customers are still buying MFPs with fax capability, Carrick observes, though this is increasingly on a 'just in case' basis rather than for regular use.

BUSINESS

Toope says businesses are overcoming a prior reluctance to use Wi-Fi printers that he puts down to security fears. This means wireless is becoming a standard or optional feature on models aimed at that market.

Mobile print capability is becoming more important, suggests George Kharoufeh, product marketing manager at Kyocera. The widespread use of iPads means businesses increasingly look for models that support the AirPrint protocol and more generally businesses are looking for printers that are as easy to use as those aimed at the home market, says Toope.

"Functions like HP's ePrint have significantly helped this transition to the mobile workforce, with people being able to print wirelessly from their personal devices without complicated driver installations," says Ben Vivoda, HP's South Pacific business manager for printing systems.

One of the shortcomings of Android in this respect is that the closest equivalent to AirPrint is Google Cloud Print, but not everyone is happy with the idea of their print jobs passing through Google's servers. Oki has a foot in each camp, supporting both AirPrint and Google Cloud Print.

The alternative is to install a printing app for the particular vendor, but that's less convenient if you have one brand of printer at home and another – let alone two or three others – at work.
On the other hand, such apps may also support network scanning to the local device or to a cloud service, suggests Kharoufeh. Turcato echoes this sentiment – Epson Connect handles printing via email (with strong security including antivirus and antiphishing mechanisms), scanning to the cloud (Box, Dropbox, Evernote and Google Drive), a printing app for iOS and Android smartphones and tablets, remote printing across the internet (Windows only), as well as AirPrint and Google Cloud Print.

While printing from mobile devices is currently a minority issue, interest is growing rapidly. While 5% of companies have implemented mobile printing, 60% want to, Toope says.

In the monochrome market, most growth has been in the higher-speed segment, according to Toope, due at least in part to falling prices. Two years ago a 30ppm duplex printer with Ethernet and Wi-Fi might have cost over $1,000, but now such a model can cost less than $200. He's tipping sales growth of as much as 50% in the 30+ ppm segment.

The story is similar in the colour segment, Toope says, with 35+ ppm gaining attention from customers. The 45+ ppm category is expected

to grow by 50% during 2013, thanks to its 'great value for money'.

HP has recently introduced the Officejet Pro X: "It's the world's fastest desktop printer as recognised by Guinness World Records," says Vivoda. "The new inkjet printer offers up to twice the speed of a laser printer at half the cost, whilst also using up to 50% less energy. It's supported by HP's ePrint mobile printing technologies and is targeted towards the SMB segments. It will ultimately help businesses print more and save more."

Speeds of up to 70ppm (40ppm in 'laser-equivalent mode') are achieved by HP's PageWide print head, says Jonathan Edmonds, business planner in HP's printing and personal systems group. "Allowing a print head to span the full width of a page means we get best in class reliability and unrivalled speed, even in a full quality laser equivalent mode," he explains. "[This] provides reliability through having no moving parts – the only moving component is the page being printed – and speed, [as] there is no time lost waiting as the print head moves back and forth across the page."

Oki has innovated with the recent introduction of the C711WT colour LED printer with white toner – the first on the market, according to de Silva, though he admits there have been some very expensive inkjet printers with white ink. The significance of white ink is that it allows printing on transparent or coloured media (including black 'chalkboard' paper), as well as the production of output with 100% coverage for transfer to T-shirts, mugs and other items.

Turning to MFPs, Bell notes growing interest in this part of the market, while Toope says price reductions contributed to the 30% growth seen in 2012. The ability to scan to email is increasingly important to buyers, so network connectivity (along with duplex capability) is becoming a standard feature of this segment.

Despite the falling cost of colour, the monochrome MFP and printer segments are still growing due to the lower cost per page, Toope observes. But that's offset to some extent by initiatives such as the way Fuji Xerox's managed print service allows pages with small amounts of colour to be printed at the mono rate. Bell picks up on that theme, too, observing a demand for the intelligent and efficient use of colour (for example, limiting the use of colour to certain people and restricting the volumes they can produce) to keep costs under control. On the other hand, Kharoufeh says monochrome still accounts for around 80% of the MFP market, a sharp contrast with the copier/MFD market where the proportions are reversed.

To add to the confusion, de Silva says customer demand favours MFPs over single-function devices and colour over mono (at least in the A4 market), although demand for A3 colour devices is dropping.

The underlying trends for 2013 are more speed and more functionality for your money, Toope predicts. Features that used to be exceptional are becoming expected. "Printing is a very mature market," says Kharoufeh, so there's a need to differentiate by providing added value, not just gimmicks. An example is the recently introduced Kyocera Teaching Assistant, which runs on the MFD itself and "creates on-demand tests, grading and analysis documents, and simplifies the time-consuming task of examining and evaluating student performances". Apparently it's just as relevant to training as it is to education.

Kharoufeh and Bell both noted a trend, from merely making "marks on paper" (as Bell put it) to integration with business processes. Bell says this is one of the reasons why colour touchscreens are showing up on increasingly low-end models. It's not just about the user experience, he explains, but it also allows the movement of information and helps with the governance of business processes. For example, workflow integration on an MFP can prompt staff to enter the required metadata such as an invoice or policy number after scanning a document and then the system might automatically save the image locally (either as a file or in a document management system) while also transmitting it to a business partner such as an insurance company.

Such capabilities are becoming available to SMEs, providing them with an opportunity to save time – which can be one of their scarcest resources – while allowing customisation and promoting consistency.

Integration with applications, cost recovery systems and cloud services are of growing importance, according to Kharoufeh. For example, Kyocera provides embedded support for Evernote in certain models, while other manufacturers accommodate other services such as Google Drive.

Such integration is encouraged by Oki, says de Silva, and the company develops with SDKs to help it produce applications which work with the company's devices that are aimed at midsize workgroups and upwards, with an 'open application' architecture coming to the company's workgroup range by the end of this year. Oki also plans to release lower-end (though definitely not low-end) models that incorporate basic workflow functions such as scanning to email and saving.

GREEN IT

Businesses aren't ignoring 'green' issues, Toope says, pointing to Fuji Xerox's solid ink printers that reduce waste by up to 90% by eliminating drums and cartridges. Kyocera began pushing its eco credentials long before that became fashionable; for example, through the use of long-life components such as the 500,000-page drum life of recent models. However, Kharoufeh notes that while the total cost of ownership is still important to buyers, energy use is coming under particular scrutiny.

Another side to this is the way Epson made some big changes from its previous practices when designing its Expression home printer range. While driven by customer demands for smaller printers (the Expressions are 40% smaller by volume than their predecessors), "our long-term aim is not only superior customer satisfaction but also to produce smaller and more compact devices that use less energy and require fewer resources to make, distribute, run and recycle," says Turcato.

DISK PRINTING
FAX
OPTIONAL LARGE AND EXTRA LARGE INK CARTRIDGES
SECOND CASSETTE FOR PHOTO PAPER

7/10

$220

Canon PIXMA MX926

Improved productivity in this well-featured MFP.

www.canon.com.au

Duplex print and scan, cloud and mobile support, good-quality output.

No direct support for Evernote or Dropbox.

Installation is simplified compared with some other models, as the MX926 can be set up for Ethernet or Wi-Fi use from the front panel without the need to temporarily connect it to the computer via USB. However, the latter is there if you're only using it with one computer.

Two paper cassettes – the second primarily for photo paper – saves messing around when you want to print a photo and is tidier than the older arrangement of a rear feed plus a single cassette as the second source. And if appearance matters to you, the front cover automatically opens when printing starts to double as the output tray.

Mobile devices are supported by the Easy-PhotoPrint app for Android (as tested), iOS and Windows RT, although printing is limited to photos and scanned images. iOS users are better served by the MX926's AirPrint compatibility, which doesn't have that limitation. The app is still useful on iOS as it allows scanning directly to the device.

Cloud functionality includes Google Cloud Print and printing from Picasa Web Albums, both of which worked well in our testing, despite the latter transitioning to Google+ Photos.

Our business document printed in 41 seconds, with a first page out time of 30 seconds – that's about 5.5ppkm compared with the nominal maximum of 10ppm. The drying time needed by inkjet printers means this blew out to 67 seconds for duplex output. Document and photo printing gave good results, with a 10x15cm photo printing in a respectable 44 seconds. Colour copying was generally impressive, although earthy tones seemed muted.

The MX926 includes PictBridge compatibility, but only over Ethernet or Wi-Fi, so this feature won't work with cameras that only have USB connectivity. Printing from and scanning to USB storage is supported.

This is a generally well-featured MFP for the home office, with a limited yet useful software bundle and some interesting online content.

SOLID INK TECHNOLOGY
BUILT-IN SERVER FOR SCANNING AND REPRINTING DOCUMENTS
FAX

7/10

$5,499

Fuji Xerox ColorQube 8900

A hefty workgroup printer.

www.fujixeroxprinters.com.au

Duplex scan and print, access controls.

Mixed results when copying.

The ColorQube 8900 is a laser-like workgroup multifunction printer using Fuji Xerox's solid ink technology, which is claimed to give low total cost of ownership given reasonable volumes, the benefits of Pantone-calibrated colour and the ability to top up ink supplies at any time with no waste.

The 8900 includes Gigabit Ethernet and USB interfaces, and options include Wi-Fi, one or two 525-sheet trays, a 1,800-sheet high-capacity feeder, along with a finisher.

The large colour touchscreen makes everyday operation simple and the 8900 includes a web interface for configuration and management. The drivers can be conveniently installed on additional computers, too.

The first page of our business document took an unusually long time to appear, but only 5 seconds for page two. Fuji Xerox couldn't reproduce the first page delay on another 8900, but we hadn't determined the source of the problem by press time. Duplex printing added just 8 seconds and other documents revealed first page out times as quick as 14 seconds (Fuji Xerox claims 8.5 seconds and up to 44ppm).

Solid ink gives good results, including very little show-through on ordinary office paper, which helps duplex output. The high-gloss colours are vivid and the driver includes a 'colour by words' feature so you can opt to make 'all foliage colours slightly less green', for example.

Scans can be 'pulled' to the computer when using a TWAIN-aware program, but there doesn't seem to be a way to 'push' scans from the ColorQube. Scanning to a thumb drive seems the most convenient alternative, although scanning to email or to a folder on the printer for retrieval via the web interface is also available.

Copies of colour originals were good to fair. Text and graphics reproduced well, but photos looked washed out and gentle gradations became abrupt. The 'convenience stapler' mounted at the front-left of the scanner lives up to its name when you need to clip pages together.

WHITE TONER

THREE-YEAR WARRANTY IF PROMPTLY REGISTERED ONLINE

7/10

$3,013

Oki C711WT

Unique in its use of white toner.

@ www.oki.com.au

✓ Attractive results on coloured media and film.

✗ Not ideal for everyday printing.

The unusual feature of this A4 LED printer is that it uses white instead of black toner, allowing printing on coloured and transparent media. The white toner is reasonably opaque and white text looks good on black or other darker-coloured papers. A document that uses a handwritten or brush font at a large point size gives a pleasing result when printed on black paper.

The cyan, magenta and yellow toners aren't so dense, so dark colours on dark media tend to be indistinct unless the gloss of the toner catches the light. The degree of transparency is enough to cause colour shifts; for example, a magenta area on bright blue paper appears purple.

Apart from producing chalkboard signage and other examples of white on coloured media up to 250gsm as well as coloured images on transparent film (the white toner fills in areas that would be left bare by a normal printer), the C711WT comes into its own for producing images to transfer onto items such as shirts, mugs and mousepads. This requires specialised media and equipment that's outside the scope of our tests. An Oki spokesperson noted that TheMagicTouch (**www.themagictouch.com.au**) provides a range of products suited to the C711WT.

The C711WT isn't really suited to do double-duty as a general office printer. Since the white toner physically replaces the black, all three colours are used together to simulate black and the result has a reddish tinge. We would recommend using a second printer for everyday jobs such as reports and invoices.

Our usual test jobs aren't really relevant to such a specialised printer, but for consistency, our two-page business document took 19 seconds, with a first page out time of 16 seconds (20ppm throughput compared to the nominal 34ppm with 9 seconds to the first print) and an A4 print of our test photo emerged in 2:07min.

The C711WT has a parallel interface and the usual Ethernet and USB.

FAX

WEB SERVICES INCLUDING REMOTE PRINTING

HIGHLY apc RECOMMENDED

8/10

$899

HP Officejet Pro X567dw

A speedy office printer.

@ www.hp.com.au

✓ Fast, low cost per page claimed.

✗ Subdued colour for business graphics.

The black and grey colour scheme here, plus a mix of curved and right-angled edges, give the X567dw a contemporary and unobtrusive look. But what really sets this business all-in-one apart is its use of HP's page-wide print head to deliver remarkable speed. An array of 42,240 nozzles means the print head is fixed and only the paper has to move.

HP claims up to 70ppm and although the X567dw wasn't quite that fast in our tests, it did come close. The first page of our business document appeared in 11 seconds and the second dropped 1 second later. Duplex output increased the total to 21 seconds. We tried a simpler yet longer job and the run-on speed was over 60ppm. The quality was good, but some colours seemed muted.

Mobile printing support comes in the form of apps for Android and iOS, as well as AirPrint support for iOS.

There was no sign of a setting for borderless prints on photo paper – something we've noticed before with HP business printers. Our 10x15cm bordered prints took between 28 and 36 seconds on HP Advanced Photo Paper, with the results acceptable rather than impressive.

Scans can be sent from the touchscreen directly to a connected computer running HP's software, or to a shared folder. There's also a 'webscan' feature that allows scanning via the printer's web interface, which is especially convenient as it doesn't require any special software. Standalone scanning to and printing from a USB drive is also supported.

The copying function worked particularly well, giving good colour reproduction with practically no banding.

ePrint functions include the ability to email documents for printing, on-demand or scheduled printing of newsletters, integration with cloud services and printing items such as forms and children's activities. One irritation was that some ePrint items insisted on printing from the manual feed on the side of the printer instead of the main tray. apc

PERFORMANCE ON A BUDGET

Just how much of a gaming/server PC can you build for $900? Darren Yates takes on the challenge of getting maximum performance for minimum dollars.

One of our younger *APC* readers asked this month about building a PC that would handle fast gaming and server work for under $900. While it's easy to dismiss the idea as mission impossible, it's actually worth looking at the idea, particularly when PC component prices are at or near all-time lows.

NOT SO IMPOSSIBLE?

At this budget, there's no doubt that we have to think creatively to get this system over the line. We could cut corners by ditching the monitor and operating system, and we're assuming the reader already has them. It'd be convenient – and a cop-out. But as usual, we'll give you the choice: we'll build a system with a monitor included and another without. It'll show you clearly where your dollars go in a low-cost build and why it's sometimes tricky sorting out where those dollars are best spent.

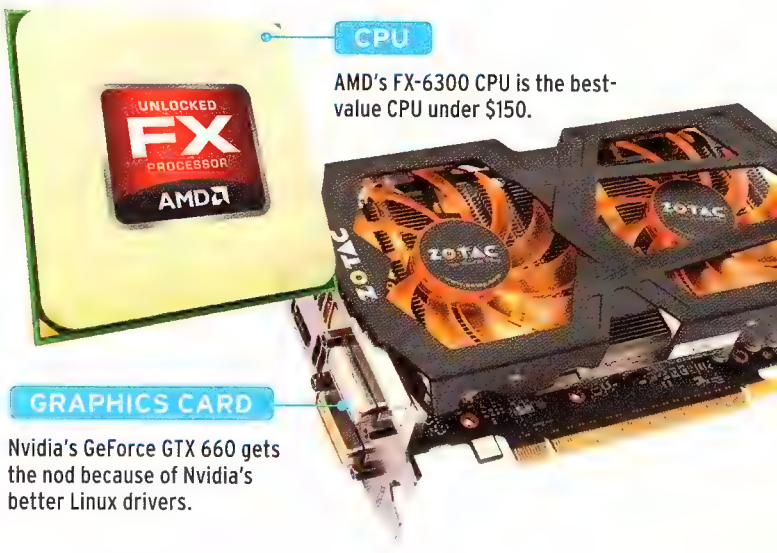
Building a low-cost system is all about targeted spending – targeting the areas that matter most and covering the other areas adequately so there are no obvious holes to ruin your experience. Here's how we did it.

OPERATING SYSTEM

The operating system isn't the component you'd ordinarily start with, but this is no ordinary system. To get decent gaming and server features at this price, we can't afford Windows 8 – the only option is Linux. However, it's actually a pretty good option. It's already the OS that runs a squillion web hosting servers around the world, and with the arrival of Valve's Steam client on Linux, it's now a more-than-passable gaming option, too. Best of all, Linux is free. We're recommending the Ubuntu 12.10 64-bit version, which is easy to use and known to work well with Steam.

PROCESSOR

If we have to fork out for a monitor from our $900 budget, AMD's FX-6300 processor becomes the must-get option. This six-core Piledriver chip delivers good performance for its $145 price tag. Gaming speed is a combination of graphics card and CPU – mostly graphics card. Our rule of thumb is to apportion the GPU/CPU cash split in something of a 2:1 ratio, where for every $2 you spend on a graphics card, you spend $1 or so on the CPU. If you don't need a monitor, we'd go for Intel's cheapest quad-core chip, the Core i5-3470. Some say it's hard to determine performance across different CPU brands, but one parameter that isn't a bad test is price. The i5-3470 sells for $200 and on the whole is a faster performer than the FX-6300; for gaming and general server work, though, the FX-6300 should be more than enough.



MOTHERBOARD

Going for the FX-6300 CPU means an AM3+ motherboard. Gigabyte's GA-970A-D3 is a steady option with plenty of extras, including six SATA 6Gbps ports for more drives. It's also $100, which certainly doesn't hurt. Any decent Z77-chipset board for around the $100-110 mark is a good long-term choice for the Intel system, allowing for an upgrade to an overclockable K-series chip in the future (if they're still available).

ASK US!

Looking to make your perfect PC, but not sure what parts to buy? Every month, our PC expert Darren Yates solves a readers' PC building quandary. Email us at contact@apctest.com for your chance to get building!

RAM

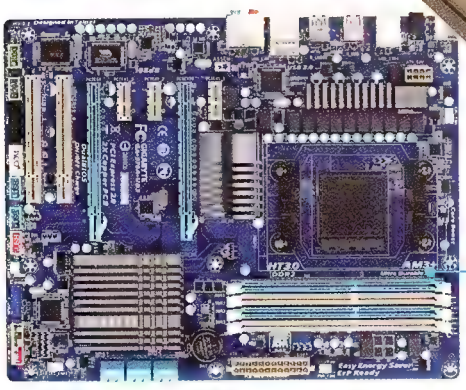
Given the budget, 8GB is about right for this build – more won't really help and it's enough to keep a 64-bit operating system humming along nicely. Whether it's 1,333MHz or 1,600MHz is up to you and your budget; if you can get the faster speed without spending any more, grab it. With only $900 in the kitty, we have more important components to cover.

GRAPHICS CARD

If this system is supposed to be able to game, we may as well make a decent go of it. Given the rest of the build, we'd have been happy to go with a Radeon HD 7870 GPU option for this budget. The problem is AMD's Linux drivers – most gamers will agree they're not great, particularly for first-person shooter games.

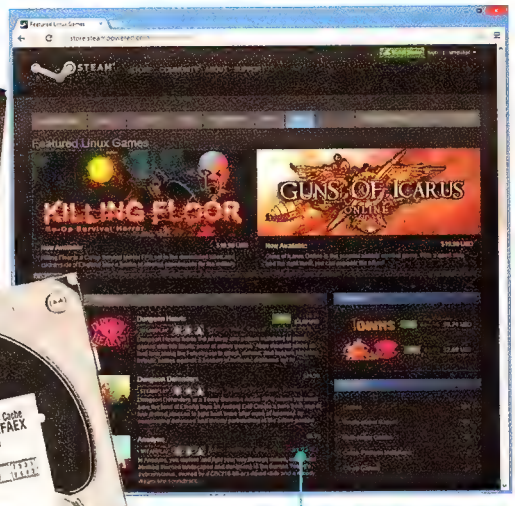
PSU

Antec's VP550P PSU is made by Delta Electronics, which does nice work.



MOTHERBOARD

Gigabyte's GA-970A-D3 motherboard has plenty of features to suit this system.



STEAM

Valve's new Steam client makes Linux a viable gaming option.

HARD DRIVE

Western Digital's 2TB Black drive gives speed and reliability.

Here, Nvidia's closed-source drivers are the better option. For that reason, we've included an Nvidia GeForce GTX 660 GPU-based card instead. Send your flame mail to **contact@apctest.com**.

STORAGE

Making our choices all the more difficult is the desire for server functionality, so not only do we need reliable storage, it needs to be fairly plentiful as well. That means a green-grade drive is out of the equation. So we've gone for Western Digital's Black 2TB model. It costs more, but reliability has to count here. Obviously an SSD would be great, although we'd have to rob the system somewhere else to fit it in. The Intel/no-monitor system has a 1TB Blue-grade (between Green and Black) Western Digital drive since that system has to figure in the $149 cost of Windows 8 Pro. Compromises all round, really.

MONITOR

Getting a monitor into a $900 system that has to handle gaming and server functions is simple, really – you go for the cheapest 22in monitor you can find. Sure, you can whinge that cheapest doesn't often mean best, but again, there's only so many ways you can spread $900 and we've already pushed past that level more than we'd like as it is. Interestingly, at the budget end of the market, a 22in LED monitor costs about as much as Windows 8 Pro.

CASE & PSU

We go on about this every month, but it just has to be said: skimp on the case if you have to, but don't skimp on the PSU. You want a case that's large enough to handle a GTX 660 graphics card and the Gigabyte GZ-PD-PLUS will do that. More important is the quality of the PSU.

We prefer to know who manufactured the PSU rather than whose brand is on top and the 550W Antec VP550P is not only cheap, it's made by Delta Electronics, which has a good reputation. This'll be enough for the GTX 660 or HD 7870. Combined, you're looking at around $100, which is good.

WHAT'S MISSING?

We've not included a keyboard or mouse and we haven't included an optical drive either. If you're playing Steam on Linux, you won't need an optical drive and there are gazillion ways to get Linux onto your hard drive using a USB flash drive. You could also throw in a speaker system if you want, yet with only $900 to burn through, you have to stick with the basics.

DOABLE, WITH A FEW COMPROMISES

If you've never used Linux before, there's something of a learning curve here, for sure. However, the $150 you've saved on Windows makes the rest of the system's higher-performance features possible.

A system designed for gaming and server functionality has to have a good CPU/GPU combo plus enough reliable storage to make it worthwhile. Ultimately, that's what we've concentrated on. It's certainly not perfect, but perfection definitely costs more than $900. That said, combining Steam with Linux is a masterstroke for value-conscious gaming, plus you've got enough nuts and bolts to create quite a reasonable server, too.

DEVELOPMENT PCS

	Build #1	Cost	Build #2	Cost
CPU	AMD FX-6300	$145	Intel Core i5-3470	$199
Motherboard	Gigabyte GA-970A-D3	$100	ASUS P8Z77-M	$110
RAM	8GB DDR3-1333 Kingston ValueRAM	$55	8GB DDR3-1333 Kingston ValueRAM	$55
Graphics cards	Nvidia GeForce GTX 660	$230	AMD Radeon HD 7870	$230
Hard drive	2TB Western Digital WD2002FAEX	$165	1TB Western Digital WD10EZEX (Blue)	$69
Monitors	LG E2242T-BN 22in	$139	N/A	$0
Operating system	Ubuntu 12.10 (64-bit)	$0	Windows 8 Pro (64-bit)	$149
Case	Gigabyte GZ-PD-PLUS Mid Tower	$30	Gigabyte GZ-PD-PLUS Mid Tower	$30
PSU	Antec VP550P (550W)	$69	Antec VP550P (550W)	$69
Total cost		$933		$911

OUR EXPERTS SHOEHORN GPU POWER INTO A MINI PC

SQUEEZING THE TITAN INTO AN ITX CASE

Tom McNamara built a mini-ITX system to see if Nvidia's newest GPU would fit and if it could keep cool and quiet under pressure.

Nvidia's GeForce GTX Titan video card has a serious cool factor. It's the fastest single-GPU card on the market, for one thing. And it beats the competition without sounding like a fighter jet or getting hot enough to trigger a meltdown. Finally, at 10.5in, it's shorter than the reigning single-card champ, the GTX 690, by half an inch, making the Titan suitable for deployment in small form factor (SFF) builds. In fact, when Nvidia launched this card, it specifically pointed out that it was designed for use in SSF rigs, so we just had to see how things would play out in a mini-ITX environment. And why stop with the card? We figured we might as well throw in a nice CPU, motherboard, a fast SSD and some extra cooling so we could dabble in overclocking. Even though we started off with the innocent goal of gauging the experience of building a Titan-based SFF rig, in the end we decided to see just how far we could push this tiny system, and came away surprised by how much performance can be had in a rig with such a small footprint.

A plethora of options

With our GPU already decided, we had to figure out which platform to build around and going mini-ITX narrowed our choices considerably. First off, there are no LGA2011 motherboards in that form factor, and second, Intel's new Socket 1150 Haswell microarchitecture wasn't available as of press time, leaving just AMD or Intel's venerable Socket 1155. Because this is a maximum-performance machine, we went with Intel, especially since we wanted to overclock and we know from experience that we can push a Socket 1155 CPU to 4.4GHz. That push necessitated a large CPU cooler and an overclockable motherboard.

To hold it all, we chose SilverStone's Sugo SG08 case. It's small and tastefully appointed, yet large enough for both our Titan GPU and an aftermarket CPU cooler, since its PSU is mounted in the front of the box instead of the rear. There are larger SFF cases that offer more room for fans and wiring, but we wanted to see the Titan sweat a bit, so we went with the Sugo. We also like the fact that it includes a 600W power supply that's customised for the chassis – a very nice touch that we'll discuss later on in more detail.

Wrapping it up we chose an OCZ SSD for our operating system drive and a Western Digital hard drive for media storage. We went with a slot-fed optical drive since that's the only type this case accepts and we didn't want the bay to sit empty. Finally, we used a low-profile SilverStone Nitrogon NT06-Pro CPU cooler and Windows 7 Pro.

INGREDIENTS

	Part	URL	Price
Case	SilverStone Sugo SG08	www.silverstonetek.com	$240
Power supply	600W SST-ST60F-SG	N/A	(bundled)
Motherboard	P8Z77-i Deluxe	www.asus.com.au	$200
Processor	Intel Core i7-3770K	www.intel.com.au	$340
Cooler	Nitrogon NT06-Pro	www.silverstonetek.com	$69
Graphics card	GeForce GTX Titan	www.nvidia.com	$1,249
RAM	2x 8GB Vengeance	www.corsair.com	$130
SSD	256GB OCZ Vector	www.ocz.com	$280
Hard drive	2TB WD Caviar Black	www.wd.com	$165
OS	Windows 7 64-bit OEM	www.microsoft.com.au	$100
Optical drive	Samsung SN-208DB/BEBE	www.samsung.com/au	$32
Total			$2,805

01 ITX-cellent

The ASUS P8Z77-I Deluxe is an expensive board. The motherboard is loaded with beefy overclocking options, built-in Wi-Fi, USB 3.0 front-panel connectors and eSATA – it's just as full-featured as boards twice its size. ASUS manages this feat partly because it added an extension called a riser, which holds extra capacitors and other circuitry, effectively extending the board's size vertically (image A).

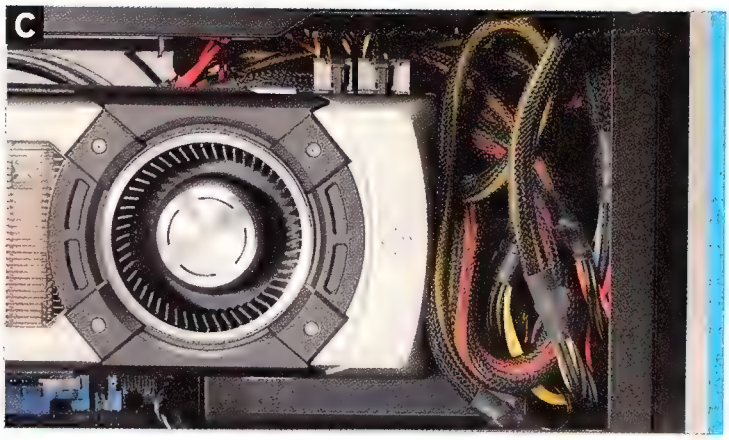
We installed the CPU cooler's backplate before installing the motherboard, as the case has no opening behind the board. The heatsink on the northbridge also has a plastic fastener that we needed to push up a little to make the CPU backplate fit securely against the motherboard. The board's riser card also has two screws that needed to be removed and then reinstalled after the motherboard was inside.

02 Cool customers

CPU coolers like SilverStone's NT06-Pro are designed for use in chassis like this, where the power supply isn't installed over the motherboard, leaving a bit of room over the CPU for some additional cooling power. This heatsink is oriented parallel to the CPU instead of sticking up like a tower cooler, so it fits into tight spots where tower coolers won't. To make the NT06-Pro fit, we initially pointed the tips of its heat pipes towards the PCIe slot, but they were actually blocking it slightly, so we adjusted them to face the rear of the case (image B). The CPU fan went on top, blowing air down through the heatsink and complementing the positive pressure airflow from the 18cm case fan right above it. Installation was simple and took only 10 minutes, which included adjusting the orientation of the heatsink. We could have flipped the case fan and used it as an exhaust instead (ideally flipping the CPU fan as well), but this creates negative pressure (a slight vacuum), which usually leads to higher temperatures.

03 Godlike processing unit

Nvidia's GeForce GTX Titan is basically the star of the show here. The SG08 case can technically fit a GeForce GTX 690, which costs the same as the Titan while outperforming it by as much as 20%. But dual GPUs means SLI and that can be glitchy, which is why people prefer single-GPU gaming. The GTX 690 is also noticeably louder under load than the Titan and it produces substantially more heat. To install the video card, we could have gone in from the top or the side. We chose to go in from the side at an angle, in order to make sure no cables got trapped below the card. And because the Titan is just 10.5in long in a case that can handle 12.2in, there was space between the end of the card and the front of the case to hide the power supply cables (image C).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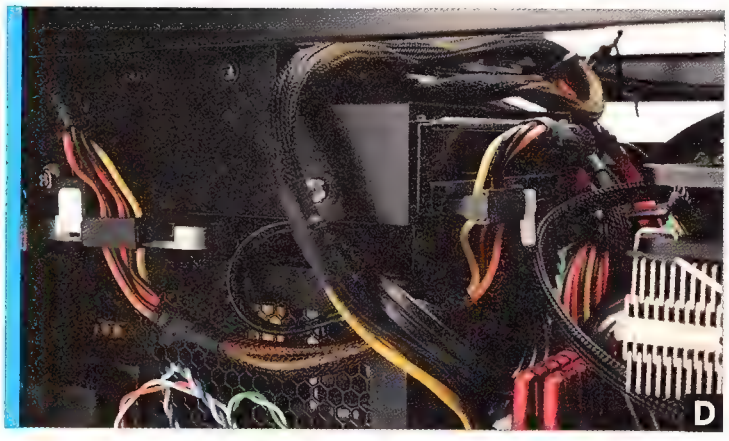
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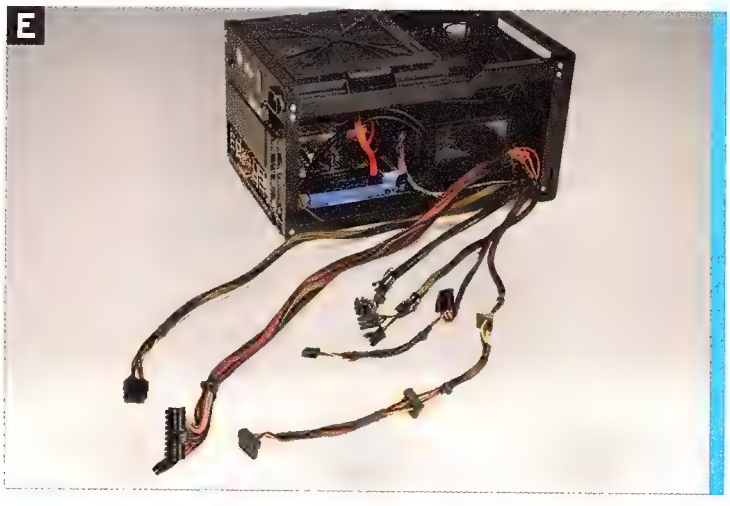
04 Drive me crazy

The 256GB OCZ Vector is our SSD of choice this time. You could save money with a Corsair Neutron GTX, but the price difference is tiny against the system's overall price tag. In our tests, the Samsung 840 Pro is a smidgen faster than the Vector, but it's close enough that the subjective difference between the two is non-existent. The SG08's drive cage leaves just enough room to slip two SSDs under the hard drive (image D), but we felt compelled to put the Vector in upside down to orient its SATA cable more comfortably. A 2TB Western Digital Caviar Black was also installed to give us much-needed capacity. The drive cage isn't tool-less, so a screwdriver is required for installation. Also, the SilverStone SG08 can only fit a 'slim' optical drive (normally seen in laptops), while the Samsung is only $32 from eBay. It needs a special combined power and data connector cable, which we bought online for a few bucks.

05 Down to the wiring

The SG08'S bundled 600W power supply has shortened cables that are specifically designed for the case (image E), which made our job a little easier. It also has just one Molex cable and one SATA power cable with three connectors on it, so you can only connect up to four devices. The Titan was a bit of a tight fit, but it was OK and we had enough space to tuck the power cables away. Still, it's difficult to picture an 11in video card fitting inside this case, let alone a 12-incher. While the motherboard power cables are braided, the 24-pin cable is still thick and therefore stiff. It and the 8-pin power cable ended up getting looped a couple of times within the spare real estate we had left. The GPU power cables were unavoidably snug against the top of the SG08 when the case cover went on, though; flat cables would be ideal. If anything, the biggest wiring problem we faced was with the three SATA cables we used, since they were all standard length. If we had planned better, we would have ordered some shorter cables to help reduce the clutter.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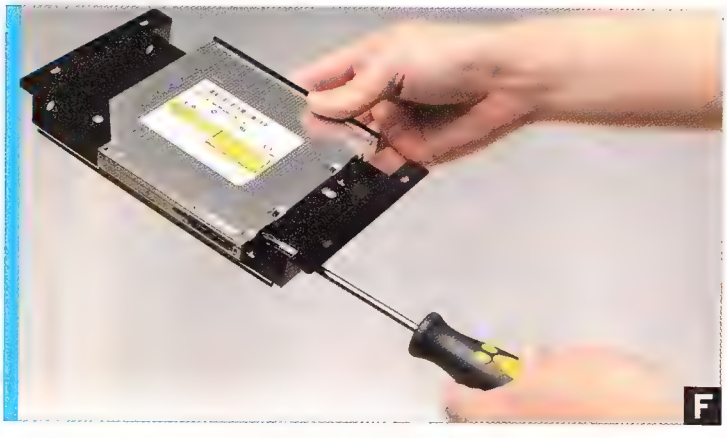
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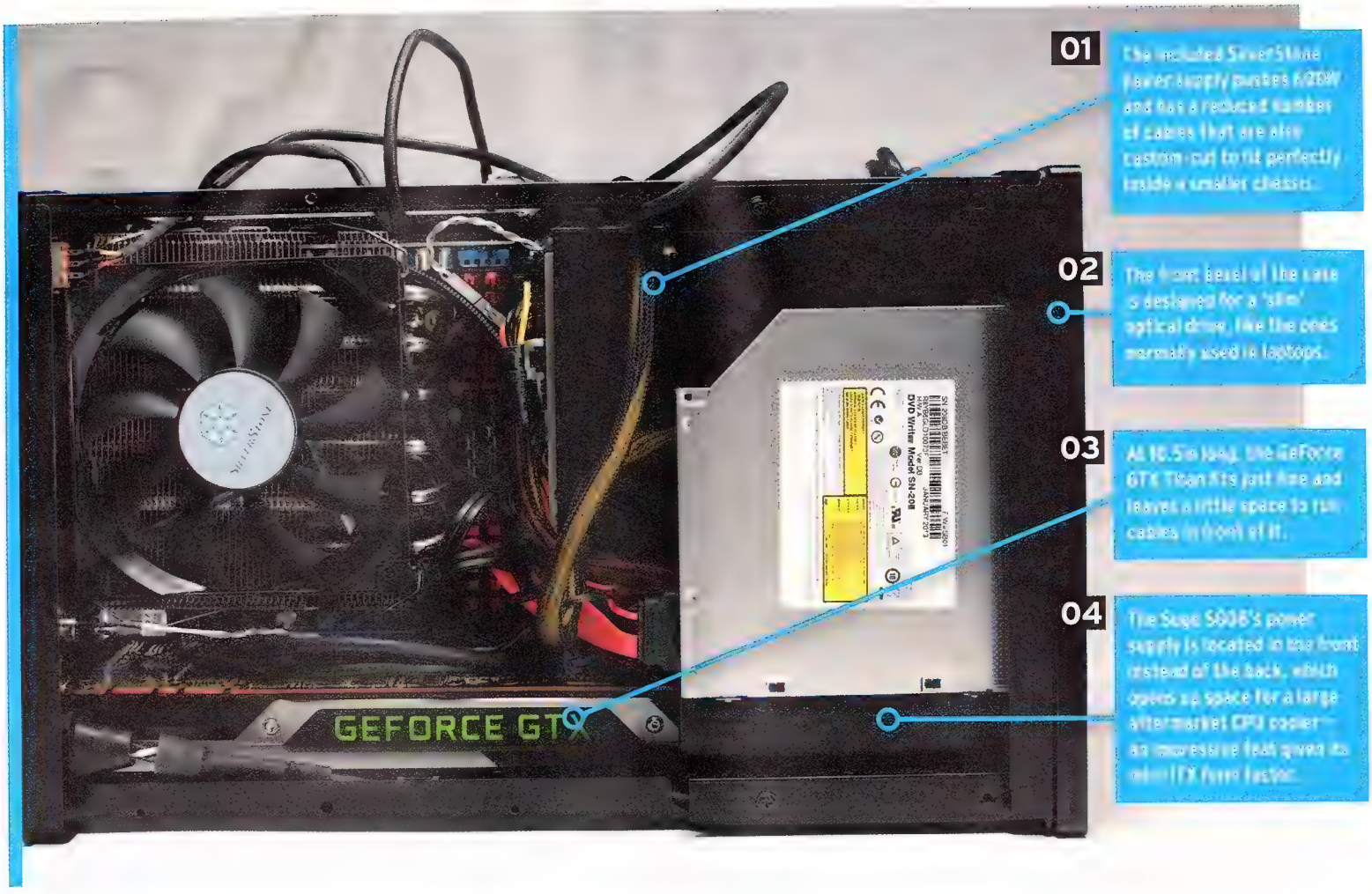
06 Miscellany

Assembling this build in the order dictated by the layering of components was a challenge. The GPU had to go in last, since the motherboard's riser card obstructs access from the other side of the case. If we had forgotten to plug in a cable somewhere, we would have had to pull out the GPU, so it was important to be methodical. We had to get creative with the cabling to get everything to fit. For example, the SSD and its right-angle SATA connector went in upside down because we were running out of room to thread the cable around the power supply. We went over the PSU instead, as there were several millimetres of space between it and the optical drive tray above. The optical drive also uses very tiny screws (image F). The SG08 comes with them, but they took a while to insert because the drive tray is recessed (it uses precut holes for you to align the screwdriver with the screw holes).


01
The included SilverStone power supply packs 600W and has a reduced number of cables that are also custom-cut to fit perfectly inside a smaller chassis.
02
The front bezel of the case is designed for a 'slim' optical drive, like the ones normally used in laptops.
03
At 10.5in long, the GeForce GTX Titan fits just fine and leaves a little space to run cables in front of it.
04
The Sugo SG08's power supply is located in the front instead of the back, which opens up space for a large aftermarket CPU cooler – an impressive feat given its mini-ITX form factor.
GEFORCE GTX

The little overachiever in action

With our mini-rig assembled, cooled and ready to rumble, we were primed to see how hard we could push these components. After all, the SG08 sports a large grille on the side, offering our GPU the chance to pull in cool air, so the Titan has some room to breathe.

The case's unusually large 18cm 'penetrator' fan blows directly down on the core of the system at up to 1,200rpm and the CPU has a big heatsink with a 12cm fan that can go up to about 2,200rpm, so we figured cooling wouldn't be an issue.

To our delight, the GPU handled a core overclock of 150MHz and a memory OC of 400MHz without complaints. The Titan did get up to 81°C in our temperature-controlled Labs, which hovers around 20°C, but Nvidia has told us the Titan is fine up to temps below 95°C.

The Titan stayed fairly quiet and pushed almost all of its heat out of the system, too, which was excellent. So as far as the question of a Titan being able to survive in a SFF chassis goes, we'd say it works like a charm and we can't see it causing any issues at all in other small cases.

You're probably surprised to see that this system's 3DMark11 score of 5,571 was within 5% of our zero-point system, which boasts a hexa-core i7-3930K overclocked to 4.2GHz and a GTX 690. However, the GTX 690 wasn't overclocked and the zero-point's GPU scores were achieved with the drivers that were out when it was built in March of last year, so much of the surprisingly small gap is probably thanks to Nvidia's constant software optimisations made since then.

The CPU was a trickier affair. Once you get beyond about 4.4GHz, Ivy Bridge CPUs start heating up dramatically. Taking it to 4.6GHz or even 4.5GHz gave us temperatures we didn't think would be sustainable outside of our air-conditioned testing environment. The NT06's bundled fan also isn't particularly quiet once it revs up to about 2,200rpm, and the case fan adds noticeable noise when switched to 'high'. Even though we thought this little rig might be able to sit in our living room and stay quiet while gaming, we're left to conclude this particular setup wouldn't be the best choice.

So, the overall system performance was excellent, the build quality of the case was great (though the bundled PSU could use shorter motherboard power cables), the motherboard handled our CPU overclock quite well and we didn't have to do anything questionable or dangerous to fit everything into the SG08. Overall, we'd say the mission was accomplished.

Now, to build a Titan SLI SFF rig...

BENCHMARKS

	Zero point		
Premiere Pro CS6 (sec)	2,000	2,700	(-26%)
Stitch.Efx 2.0 (sec)	831	768	
3DMark11 Extreme	5,847	5,571	(-4.8%)
x264 HD 5.0 (fps)	21.1	16.95	(-19.7%)
ProShow Producer 5.0 (sec)	1,446	1,336	
Batman: Arkam City (fps)	76	80	

0% 10% 20% 30% 40% 50%

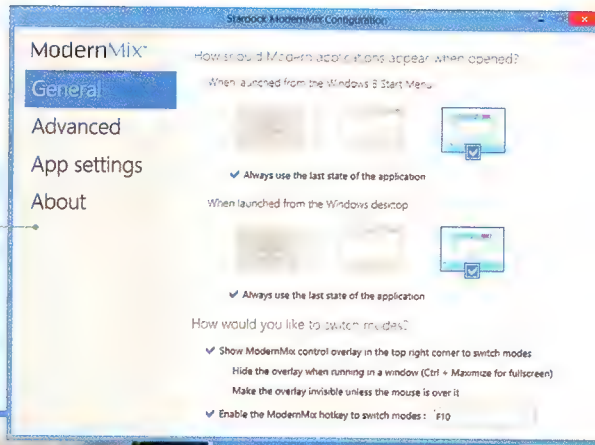
Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K at 3.8GHz, 8GB of Corsair DDR3-1600, on an ASUS Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD and 64-bit Windows 7 Professional.

Windows 8 Store

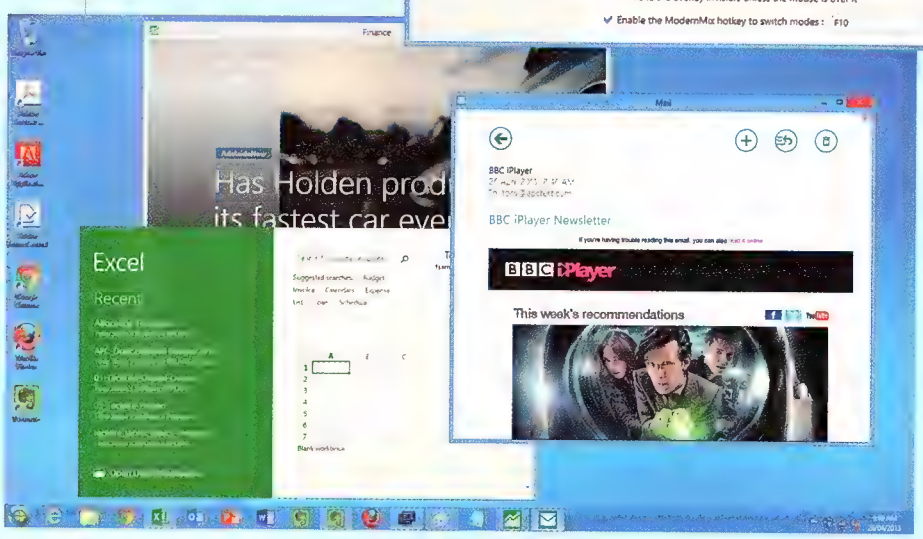
THE MODERNMIX FIX

Another third-party app to make Windows 8's UI more usable.

US$4.99 | Stardock Corporation | Stardock.com



ModerMix gives you plenty of options for how the Modern UI windows should open on the traditional desktop.



Bliss – Modern UI apps open in their own Windows on the traditional desktop.

We're not going to go over the now tired debate about the pros and cons of Windows 8, but suffice to say that a lot of people actually don't mind the Modern UI, even on a PC without a touchscreen. They see the traditional desktop along with the Modern UI as a kind of Windows Plus, the old Windows plus an interesting new interface to explore that's meant for a future where Windows acts and looks the same on all devices.

The only problem is that Windows 8 tries to shove the Modern UI down your throat and forces you to choose between it and the traditional desktop. It means that if you're using a few Modern UI apps alongside traditional Windows apps, you constantly have to switch between the interfaces. We get that Microsoft positions the Modern UI not as an additional desktop, but as a kind of giant 'Start' screen over the old desktop, which is why it calls it the 'Windows 8 Menu'. To Microsoft, all Windows 8 does is take the 'Start' menu in Windows 7, blow it up full-screen, call it the Modern UI and then have you boot into it.

There are two problems with this approach: the Modern UI screen looks for all the world like a desktop – not a giant 'Start' menu that disappears once you've chosen your application. And when you open a Modern UI app, it opens full-screen and not in a window. It may come as a surprise to Microsoft, but many Windows users actually like to have multiple windows open and you can't do that with the Modern UI apps. For instance, you may want to open the Modern UI Mail application alongside the web browser and a traditional application such as Photoshop. Right now, you can't do this.

Enter Stardock, a company that initially found fame by creating a kind of Mac-like dock for Windows. Its ModernMix app (now version 1.05) forces Modern UI apps that open full-screen on the Modern UI side to open in a window on the traditional desktop side. In a flash, it's made Windows 8 infinitely more usable for us. We can now boot into the traditional desktop (courtesy of any Windows 8 'Start' button replacement app such as Classic Shell or even Stardock's own Start8) and keep a bunch of Modern UI apps open, in their own windows, with a little X in the top-right corner of the window! ModernMix is the missing link between the Modern UI and the traditional desktop, providing integration between the two that simply isn't there right now.

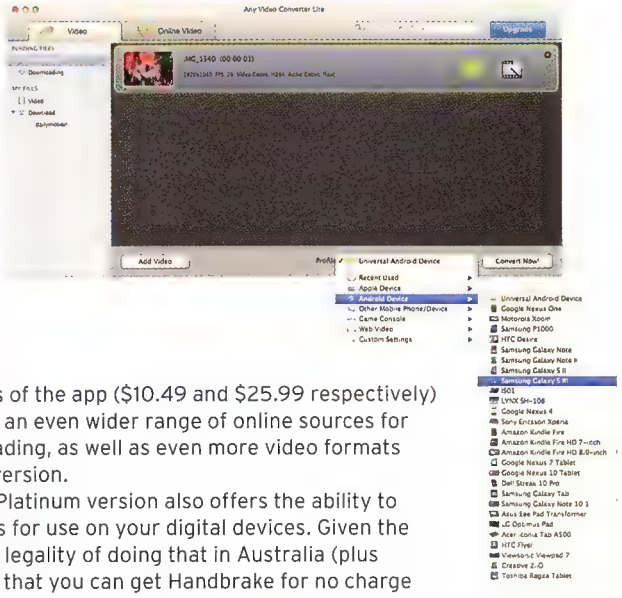
Once we installed ModernMix, we found that we started using the Modern UI desktop very much as a menu, to find apps that we'd then open over the traditional desktop alongside traditional PC applications. It's not an exaggeration to say that for us at least, ModernMix has removed much of the aggravation that comes with Windows 8 forcing you to view Modern UI apps in full-screen mode. On a giant 27in monitor, we can open several of them on the traditional desktop in multiple windows and finally have some of the best apps from the new Windows Store open alongside our traditional ones.

ModernMix isn't available from the Windows Store. You need to go to Stardock's home page at **www.stardock.com** and download it from there. If you're trying to live with Windows 8's idiosyncrasies, it's the best US$4.99 you'll ever spend (and if you don't have a replacement 'Start' button that lets you boot into the traditional desktop, also get Stardock's Start8 app while you're there).

Any Video Converter Lite

Simply does what it says.

Free; more fully-featured versions available | AnvSoft Inc. | tinyurl.com/AVCLite



Any Video Converter is the kind of utility we love: it does one thing, does it brilliantly and costs nothing. As the name suggests, it converts video. The range of formats supported for both input and output is extraordinary, though it's worth noting that it will not convert DRM-protected video. So if you want to copy your iTunes-sourced TV shows for use on an Android tablet, or copy DRM-protected WMVs into iTunes, this isn't the tool for you.

Output options are extensive and presets are available for a range of Apple and non-Apple devices including PSPs and a range of Android tablets. It can also add your video automatically to your iTunes library after conversion, if you so choose.

An extra trick is the ability to download video from various online sources (limited to Dailymotion and Metacafe in the free Lite version) for conversion into whatever format you desire. The Pro and Platinum versions of the app ($10.49 and $25.99 respectively) support an even wider range of online sources for downloading, as well as even more video formats for conversion.

The Platinum version also offers the ability to rip DVDs for use on your digital devices. Given the dubious legality of doing that in Australia (plus the fact that you can get Handbrake for no charge quite easily and it works great – cough), we wouldn't recommend paying extra for that feature.

Watee

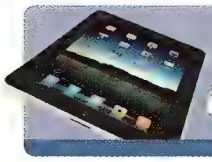
$2.99 plus in-app purchases | sunny Ignatov | tinyurl.com/watee

We're suckers for a physics-based puzzle game and *Watee* is that with a twist. It's a puzzler in which your goal is to keep your pet – the eponymous Watee – hydrated. This means managing the fluid dynamics of water in the form of liquid, steam and bubbles (there may also be ice, although we haven't played far enough into the game to know that yet). It's at once simple and demanding, logical and kind of insane. On top of the purchase price, further level packs can be purchased, and we expect more to come.

Fotor

Free | Chengdu EverImaging Science and Technology Co., Ltd. | tinyurl.com/FotorEditor

There are oodles of free utilities for iOS that will do a few quick corrections, add a filter or a special effect to your photos and share them, but surprisingly few for the Mac. Mac photo editors have generally aimed at more 'serious' levels of functionality rather than simplicity or low cost. Fotor changes that. It offers a wide range of image correction options, a good selection of filters and some special effects including frames. It offers all of this in a full-screen Mac app, optimised for Retina displays. It looks beautiful, even with so-so photos. And did I mention it's free? As well as the usual image corrections (like cropping, straightening and brightness), it offers 'scenes' much like a mid-range camera, allowing you to correct photos according to the circumstances in which they were taken – something iPhone snappers will welcome. It also includes one of the more sophisticated tilt-shift tools we've seen in a free app. It's simple enough for anyone to use, yet powerful enough for serious editors to make good use of.

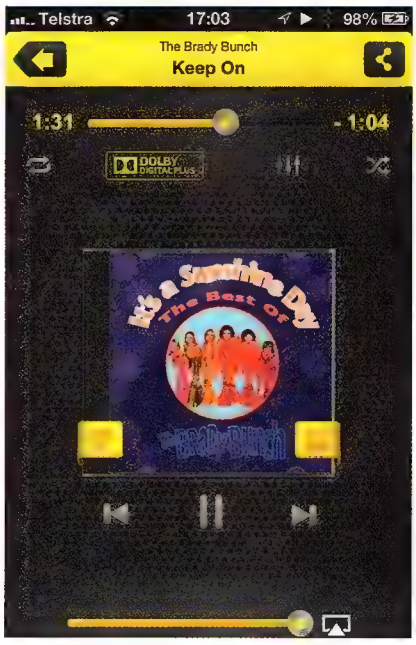


App Store | IOS APPS

Jabra Sound

Improve your audio.

Free | GN Netcom | tinyurl.com/JabraSound



This free app is designed to complement Jabra's recently released range of REVO headphones and it does that very well. However, it will also enhance your music playing, regardless of the brand of headphones you use.

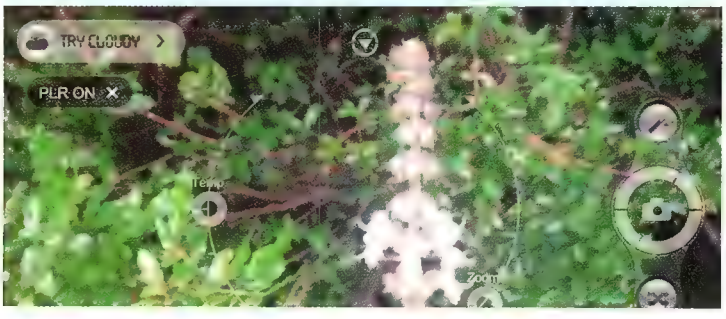
For one thing, it includes a graphic equaliser, with presets for various genres of music. Why Apple's native music player doesn't have one is quite beyond us, although you can correct that deficiency for free with this app.

Jabra Sound also includes Dolby signal processing, which reduces noise and can simulate a surround sound effect. This feature does seem to work best with the Jabra REVO headphones, presumably because of some particular optimisation feature, although again, even with non-Jabra headphones the Dolby effect certainly improves things.

Blux Camera Pro

$2.99 (iPhone) | Yin Xue | tinyurl.com/bluxcamerapro

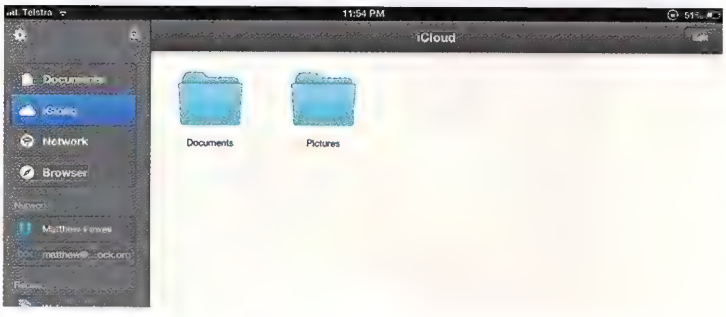
If you don't feel that iOS's native camera app is quite up to it, feature-wise, then you've probably tried a few alternatives. We sure have. At the moment, Blux Camera Pro has become our default camera app of choice, thanks to an 'artificial intelligence' agent that collects various data including your location, the amount of available light, local weather and of course, a quick examination of what's on screen, and suggests settings that may improve your shot. It actually suggests things out loud, with a schoolmarm tone of voice that can get a little annoying, but it's usually right. It includes various shooting modes and lighting presets (named after cities like Seoul, Sydney, Toronto and so forth, but you'll get the hang of it) and the AI will tell you which one will give you the best shot in your particular circumstance. It also has a toggle to remove the purplish-blue flare that often shows up on iPhone photos because of the glass on the lens. We don't know any another app that does this. There's a companion app called Blux Lens (99c), which allows you to use one camera to control another using Blux Camera Pro. Simply pair the two phones and set one up on a tripod or a shelf, and use the other to take photos with it remotely.



Documents By Readdle

Free | Readdle | tinyurl.com/readdledocuments

Readdle makes some of our favourite productivity apps for iOS, including Printer Pro (very useful if your printer doesn't support AirPrint) and Scanner Pro (which turns an iPad into a scanner of sorts). Documents by Readdle is its entry into the document viewer segment dominated by the likes of GoodReader. As well as simply viewing documents of various kinds, you can open archives, annotate PDFs and play media files. It has a web browser to allow you to download files from various sources and you can set the 'user agent' to make the browser impersonate a variety of different web clients, so the site you like that blocks mobile Safari is no longer an issue. Its great strength is its connectivity to various cloud-based storage services such as Box.net, Dropbox and iCloud – just about any service you could name. With iCloud, you can even set up subfolders to hold documents of different kinds – that's right, a file system, right there in iCloud. Now that the app is on iPhone as well as iPad, that means you can keep documents from apps that don't necessarily support iCloud natively synced across your devices. If Documents By Readdle were to cost you money we'd say it was worth the price for that alone. As it's free, we don't understand why you haven't downloaded it yet.

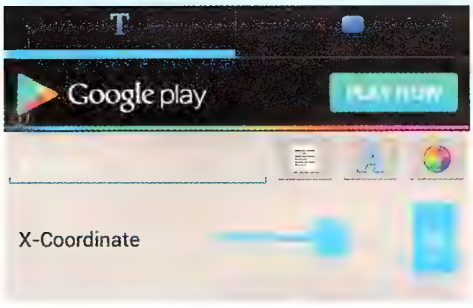


Google Play | ANDROID

Simple Text — text icon creator

Free | $1.02 ad-free | tinyurl.com/d4y7xdv

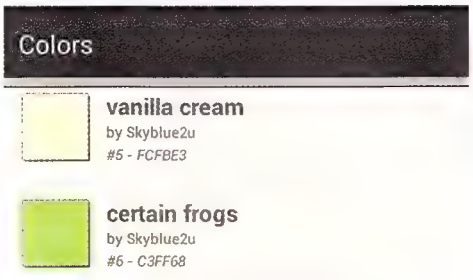
Simple Text is an easy way to create text-based icons for use on your phone's home screens, enabling you to better achieve a clean, minimal aesthetic that stands out from the rest. Obviously, you can choose your own text, but you can also select the icon size; text size, colour, placement and rotation within the icon; the background colour (or a gradient); how round the edges are; and what type of shadow it should have. You can even use your own TTF fonts by placing them in the \sdcard\Simple Text\ fonts\ directory.



Colors

Free | Tim Clark | tinyurl.com/ceqy952

Further building upon the stark, minimal aesthetic for your Android phone, why not remove all texture from the background of your phone and apply just a single colour? With the option to do so notably absent from Android, it's great that there's now a free method to do so, especially as it goes just that little bit further. How so? By allowing you to not only pick a colour from the colour wheel (or a hex value), but also scroll through the many user-generated (can you believe it?) colours from the online colour-obsessed community at **colourlovers.com**.



ezPDF Reader

$3.99 | Unidocs Inc. | tinyurl.com/czra7c3

With no native PDF support on Android, this app's addition to our handsets may not have brought much excitement, but it did bring relief, especially when we found ourselves at a gig, having forgotten to print out our tickets. If you work with PDFs, you'll also be pleased to hear that you can fill out forms (including calculations), annotate, select text and place it on the clipboard, as well as view embedded multimedia and more. ezPDF Reader natively supports Dropbox and Google Drive integration is but a free plug-in away.

NFC Task Launcher

Have your phone do just about anything after a quick NFC tap.

Free | Tagstand | tinyurl.com/867q5h5

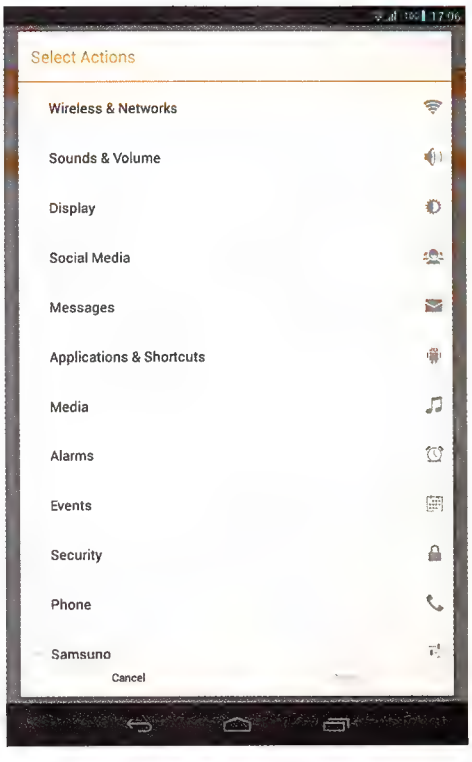
Now that smartphones with built-in near-field communication (NFC) are – after years of promise – finally becoming commonplace (although Apple will say otherwise), we're finally beginning to see interesting and useful apps pop up.

NFC Task Launcher is just such an app. The idea behind it is that you can use an NFC tag to trigger an action on your phone – from enabling 'silent' mode (put a tag on your bedside table), to checking into a venue (if you're one of those who checks in to work), to texting your other half (good on your dashboard), or joining a friend's Wi-Fi network.

The tags (or connections to Bluetooth or Wi-Fi networks) can trigger just about any action, or set of actions, that you'd want. The developers claim that they're constantly adding more and are open to suggestions (visit the web site at **nfctags.tagstand.com**).

Tags can be reprogrammed using the NFC Writer companion app, or read-only tags associated with Tagstand's cloud service, so no matter who reads them, the same action will be performed.

This concept will already be familiar to users of Locale or Tasker, but neither natively support NFC events just yet. On a side note, it doesn't really make a great deal of sense to run two automation apps in tandem, so Tasker/Locale users should perhaps check out Locale NFC Plugin, which gives both apps the ability to react to NFC tags).



Windows Store | WIN PHONE 8

PC Remote Pro

Control your PC from the comfort of your couch.

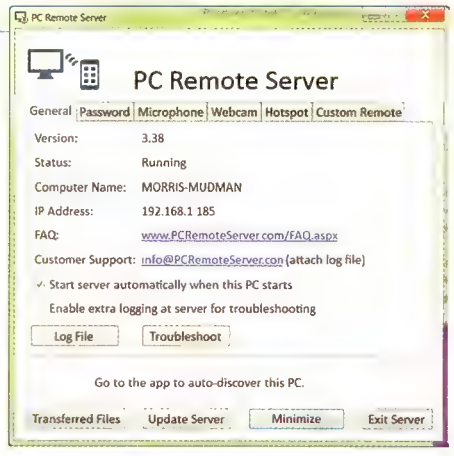
$3.49 | PC Remote | tinyurl.com/csbqs8u

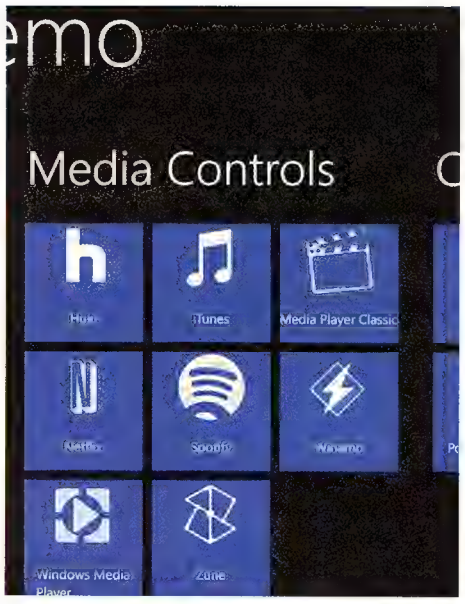
The ability to turn your smartphone into a remote for your PC has been around for a number of years now and options are available from many different developers. The most basic of these offer just a keyboard and mouse replacement, but the most complete, like PC Remote Pro, offer individual remotes for various apps, gesture-based navigation and file management.

Beginning at the most basic end of functionality, the virtual mouse pad has a specific part dedicated to scrolling within apps and Windows 8 gestures like edge swipes, zoom and drag-and-drop. You can also quickly switch between apps. In addition to typing into any app you need, the keyboard also allows you to virtually hold the Ctrl or Alt keys.

The apps supported for direct control include XBMC, VLC, Windows Media Center, Media Player Classic, iTunes, Winamp, Spotify, YouTube and PowerPoint, but custom remotes can be added from the software running on your PC. The YouTube remote even allows you to search from your phone and then watch the returned video on your TV.

The final feature that propels this app to the top of the remote list is the ability to copy and paste objects, including text or files, between your phone and your PC.

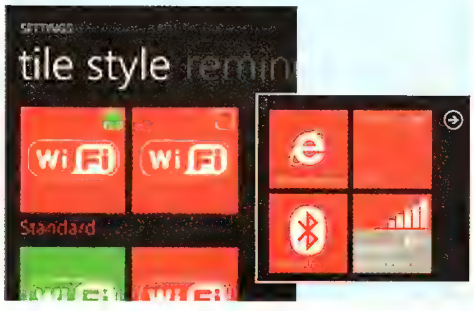




Network Dashboard

99c | Purity Consulting | tinyurl.com/bvrlqz9

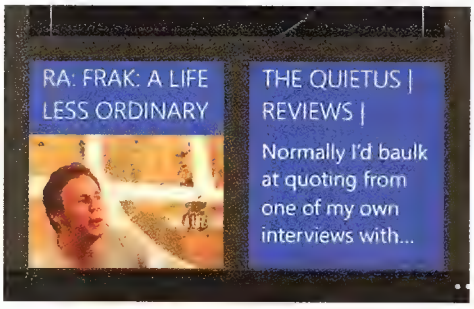
A super-handy little app that allows you to quickly check the status of your connections – such as Bluetooth, data, Wi-Fi and airplane mode – from a Live Tile on your 'Start' Menu. Better yet, you can also tap the tiles to toggle the settings. If you're the absent-minded type, the paid version of the app allows you to set reminders that will alert you if you forget to, say, turn your Wi-Fi back on before you go to bed for the night, therefore avoiding the risk that you'll miss out on a Wi-Fi sync.



Comfortable Reader for Instapaper

$2.99 | Comfortable Shoe | tinyurl.com/bpq945v

Instapaper versus Pocket will be a debate that will rage on until we're old and grey. We're Instapaper types, largely because it's just a lone guy who made a great product. As such, we have no qualms sending him US$3 every quarter for a subscriber account, which you'll need to do to use the service on Windows Phone. Comfortable Reader offers all the features you'd want, including liking, sharing and the ability to change the font of the reading screen.



Podcasts!

Free | Melting Bot Software | tinyurl.com/blcnm3j

Judging by the use of an exclamation point, the developer clearly gets as excited as we do over the prospect of being able to download and listen to podcasts while out and about. Podcasts! allows you to browse or search an extensive catalogue of podcasts. If you're looking for a particular podcast that isn't in the catalogue, however, you can still subscribe to it by manually entering in the podcast address. Subscribed podcasts can even be pinned to your 'Start' menu, so you can see when new episodes are available.

Conqu

Free | AsFusion | tinyurl.com/chkl5pb

Arguably the world's best (or at least our favourite) task methodology is 'Getting Things Done' by David Allen. So, having a GTD-compatible task manager is absolutely crucial for us. Conqu is a BlackBerry app that allows you to assign tasks to projects, as well as label the amount of energy and time required to finish it and add tags or contexts. You can view past or future tasks and it also supports the (paid) online syncing service ConquSync, so you can keep your tasks inline with those on your PC or Mac.

The Tiny Bang Story for Playbook

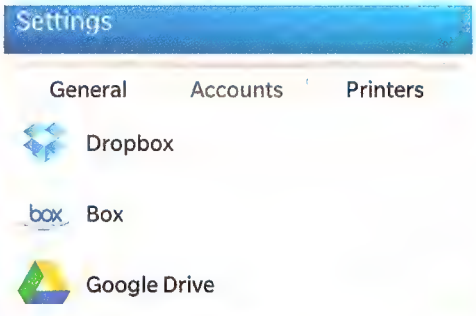
$2.99 | HeroCraft | tinyurl.com/d7yccx2

The most obvious contemporary comparison to this game would be 2009's *Machinarium*, although the point-and-click adventure has been a staple of gaming for many decades, of course. The reason we make this comparison is because the quality of the art and music is on par with that well-regarded game and the puzzles are of the same classic 'find the missing objects' style. We find these types of games almost therapeutic, but if you didn't enjoy *Machinarium*, maybe you should give this one a miss.

PlayCloud 10

$1.99 | ProgWeb | tinyurl.com/cps6h6h

While the Dropbox integration that's been built into BB10 is a great feature to have, not all of us use the service exclusively. Thankfully, PlayCloud 10 is a full-featured file explorer for BB10, which also includes the ability to upload to, download from and manage any of your files on Box.net, Google Drive, SkyDrive, SugarSync, Open Data Space, WebDAV, FTP/SFTP as well as Dropbox, and of course, those on your local device or SD card. It even supports network postscript printers over the Internet Printing Protocol (IPP).



SayIt Built for BlackBerry

Ask your BlackBerry anything.

$4.49 | BachKhoa University | tinyurl.com/cc2jvcn

Even though BlackBerry 10 comes with built-in voice commands for opening apps, dialling contacts, making appointments and more, there's still a stark difference between its functionality and that of the de facto standard, Apple's Siri.

SayIt Built for BlackBerry is an update of the popular voice assistant app for older versions of BBOS (which is known as just SayIt – don't get the two confused) and takes on the more Siri-like job of answering your questions – such as what the weather is like, who that celebrity is – or even to launch any app.

Perhaps more handily, SayIt can also directly search web sites including Google, Wikipedia, YouTube, Amazon, eBay, IMDb, SoundCloud, Vimeo, Yelp, Flickr and WolframAlpha. In fact, the app uses WolframAlpha to answer your questions, so you can ask it about any number of topics, from maths to history.

You can even have it translate spoken or written text into any of 25 languages, including: Czech, Chinese, Danish, Dutch, Filipino, French, German, Greek, Hungarian, Indian, Indonesian, Italian, Japanese, Korean, Latin (time travel not yet supported), Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, Thai, Turkish as well as Vietnamese.

Now, with all these options available to you, it can be hard to know just what you can do with the app, so thankfully, there's also an inbuilt list of commands available for your reference.

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

PERIPHERALS

HDMI OUT TO DISPLAYPORT IN?

Q I've seen discussions about connecting a graphics card DisplayPort output to a video display's HDMI input. Cables and adapters exist to make the physical connection. However, I'm wondering if the standards for DisplayPort and HDMI allow for the successful connection of a graphic card's HDMI output port to a video display's DisplayPort input. The physical connection is possible by all appearances, but will it function properly?
Dennis Frill

A Nope. It's possible to go from a DisplayPort output to HDMI (or DVI or VGA), but it doesn't work the other way. According to the DisplayPort FAQ (**www.displayport.org/faq**), there's "no cost effective way" of going from HDMI out to DisplayPort in. However, it's likely that HDMI isn't your GPU's only output, nor is DisplayPort your monitor's only input. If the monitor has a DVI input, just use the DVI connector on your GPU. If your video card doesn't have DVI out and is truly HDMI-only, use an HDMI-to-DVI adapter cable. You'll miss out on audio over HDMI, but at least you'll have a picture.

HARDWARE

TOO MANY PCIE FLAVOURS

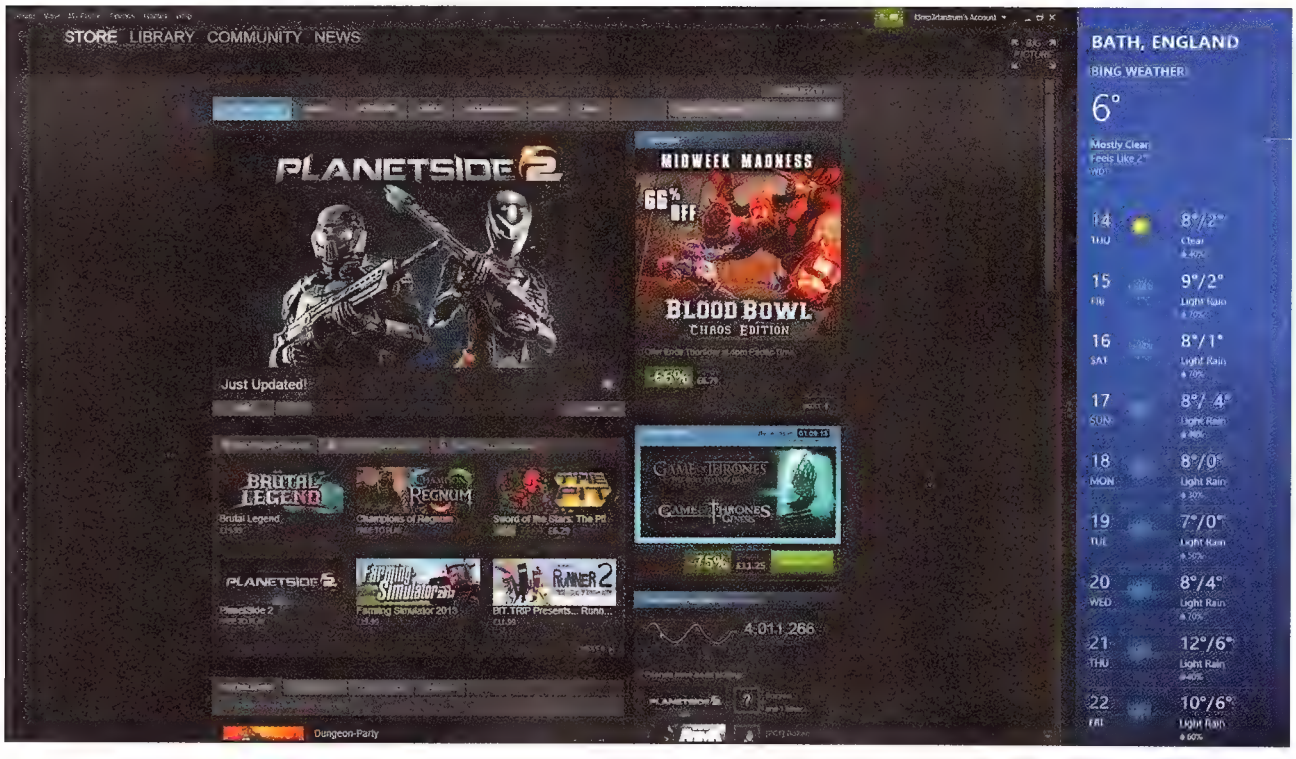
Q With the arrival of Windows 8, I upgraded my old HP Pavilion Elite – originally a Vista machine, later upgraded to Windows 7. It has its original AMD graphics card for the PCIe 2.0 slot. AMD has dropped the card into legacy support and while the driver seems to work in Windows 8, it gives an odd dialogue box on shutdown. I'm wondering if I can get a new card with support. Can I put a PCIe 3.0 card in my PCIe 2.0 slot, running at a slower bus speed? And what are my options for upgrading? I'd love to have a card that allows programming for more than graphics output.
William Biesty

A Yes, you can put a PCIe 3.0 card into a PCIe 2.0 slot and it will run at PCIe 2.0 speeds. When PCIe 2.0 bandwidth truly starts being a limiting factor in graphics cards (it really isn't yet), you'll have to upgrade to a newer motherboard, one with a chipset or CPU that supports PCIe 3.0 or later. But by then, you'll certainly have gotten your money's worth from your current machine.

WINDOWS

MENTAL BLOCKS

Q I recently upgraded to Windows 8 for no particular reason other than that I actually liked the look of the new coloured, blocky interface. I have seen



One of Windows 8's neat tricks is screen snapping.

The Zalman ZM-MFC3 fan controller can be hooked up to a water cooling system.

screenshots and videos of other computers running Windows 8 that have a bar on the left of the screen with the weather or the news running in it. I have tried dragging the blocks around, but it just moves them to their own column in the grid and double-clicking puts them at full-screen, but still doesn't let me have two things side by side. Can you tell me where I'm possibly going wrong?
Andrew Lanson

A The coloured blocky interface is called the Modern UI and the feature you're trying to use is called snapping. In Windows 7 we had Aero Snap, which did a similar thing. You could drag the title bar of any app to one of the sides of the screen and it would automatically snap to a new size. Dragging to the left or to the right snapped the app to half the screen's width, while dragging to the top snapped it to full screen. In Windows 8, the old-style snapping still works when you're in the old-style desktop, which is where most of us are for most of the time.

While you're in the Modern UI, things tend to work differently. First, you have to realise that the coloured blocks are just a sort of huge icon for the actual Modern UI apps. A lot of them – like weather and news – actually display live data, which tend to trick people into thinking that this is all there is. But if you click one, you'll see that they launch in full-screen mode. You can then drag them to the left or the right and they'll shrink and dock themselves to that side. You can even have two Modern UI apps on the screen at once like this – one docked to the side and one filling the rest of the screen.

There's a catch, though: the sidebar is fixed at 320 pixels wide and the minimum width for a Modern UI app is 1,024 pixels. This means you need a horizontal resolution of at least 1,366 pixels to get it to work smoothly and efficiently. So if your screen resolution is set to 1,280 x 1,024 or lower, Modern UI snapping sadly won't work. Sorry.

COMPONENTS

FANCY FAN

Q I would like to know how to connect my Zalman ZM-MFC3 fan controller to an Intel RTS2011LC liquid cooling system, specifically with regard to PWM connection to the water pump. My motherboard is an Intel DX79SI with a DX79 quad-core processor.
John Le Sueur

A For the benefit of everyone else, PWM is Pulse-Width Modulation, which is a way of controlling fan speeds by supplying a voltage that turns on and off very quickly, rather than just changing the voltage itself. The width of the 'on' pulse relative to the 'off' pulse is what determines the speed. The RTS2011LC is an integrated fan and coolant loop, and the power connection from the pump has a PWM connector for the radiator fan. The simplest configuration is just to plug the integrated fan into the PWM connection for the pump and this will automatically drive the fan speed, according to the CPU temperature. Of course, this is what you actually want to happen. But some people are control freaks and want to insert themselves in the middle of this veritable feedback loop. If you want to be responsible for keeping an eye on the temperature readout of your CPU and tweaking the fan speed up and down, you can. The ZM-MFC3 supports three standard three-pin fans and a fourth with a PWM connector. So you can just plug the PWM connector from your radiator fan directly into the Zalman controller. We can't think of any reason why that wouldn't work for you.

SYSTEMS

KEEP OUT OF THE BIOS

Q My computer boots fine as long as I don't enter CMOS and save and exit. Even if I don't load the BIOS defaults and save, my PC won't boot. I get a black screen, then switch it off and restart. Once it has restarted I get a message saying the system has experienced boot failures because of overclocking or changes of voltages. I have checked the voltages, they are correct. Set the multiplier to 18, the bus to 133, the RAM to 1066. Could there be a compatibility issue with my board (a Gigabyte GA-X58A-OC) and my processor?
Justin Doyle

A It's not a compatibility problem. Rather, the BIOS is automatically changing a setting when it starts that makes your PC unbootable. It could be that it's auto-detecting something incorrectly. Then when it doesn't boot, the BIOS falls back to its safer emergency values and reboots correctly. I notice that your motherboard has Dual BIOS. This gives you two BIOS chips on the same board, so you can have one for crazy overclocking and one for safe operation. Try flicking the microswitch labelled 'SW4' in one of the corners of the board. This will swap to the other BIOS and that one might be a little better.

CONTACT@APCTEST.COM Share your tech tips

Have you solved a tech problem or found a better way of doing things with your computer? Share your information with other APC readers by sending it in as a tip to contact@apctest.com, together with your name and contact details (details won't be printed). Alternatively, if you have a technical question post it online on our forums at apcmag.com/forums and other readers may be able to solve it.

Create a VPN server

Mayank Sharma says you can turn any Windows PC into your very own VPN server.

OU'LL NEED THIS

WINDOWS 7

The Windows 7 operating system comes with everything you need for a VPN.

Using a VPN (Virtual Private Network), you can remotely connect to a private network from an insecure public network, via secure virtual 'tunnels'. VPNs are primarily used by a business to allow its employees to connect to the office network from home, but it also has interesting applications for casual users, too. For example, you can use it to access your computer at home and even watch TV while you're overseas!

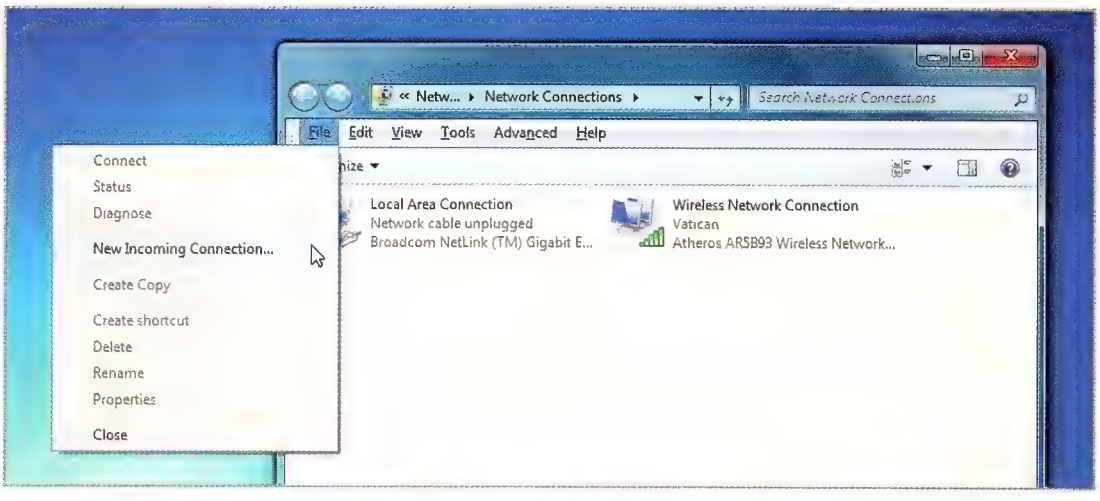
Setting up a VPN can require some serious system administration skills and dedicated networking tools, but Windows 7 comes with everything you need to set up and configure your PC as a VPN server – as well as the tools to connect to it as a client. That said, as with any network software, the process of setting up a VPN server requires knowledge of your network infrastructure at home. It may sound daunting, but we'll walk you through the process.

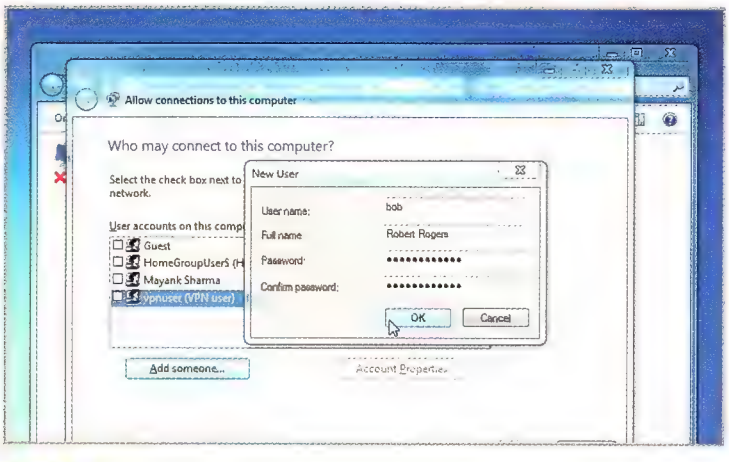
SET UP YOUR OWN VPN SERVER

Transform your machine into a secure private network with Windows 7.

01 CREATE NEW CONNECTION

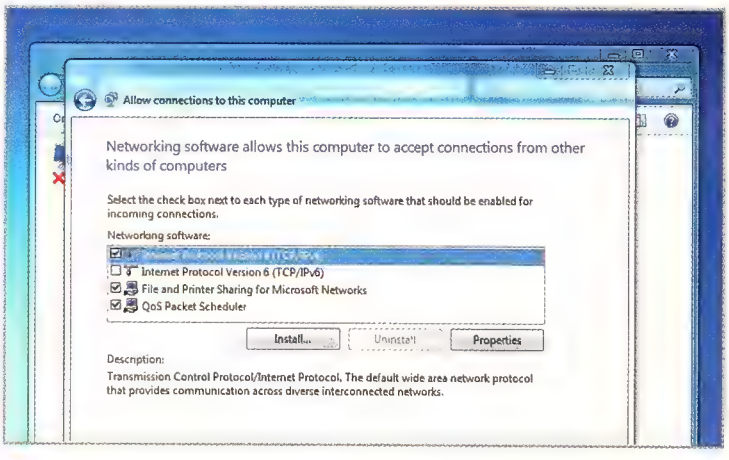
You'll start by setting up the machine you want to access. First, you need to create a new incoming connection. Click 'Start' and type **view network connections** in the search box. Click on the first option that appears to open the 'Network Connection' window. Press the Alt key, open the 'File' menu and select 'New incoming connection' to get things going.





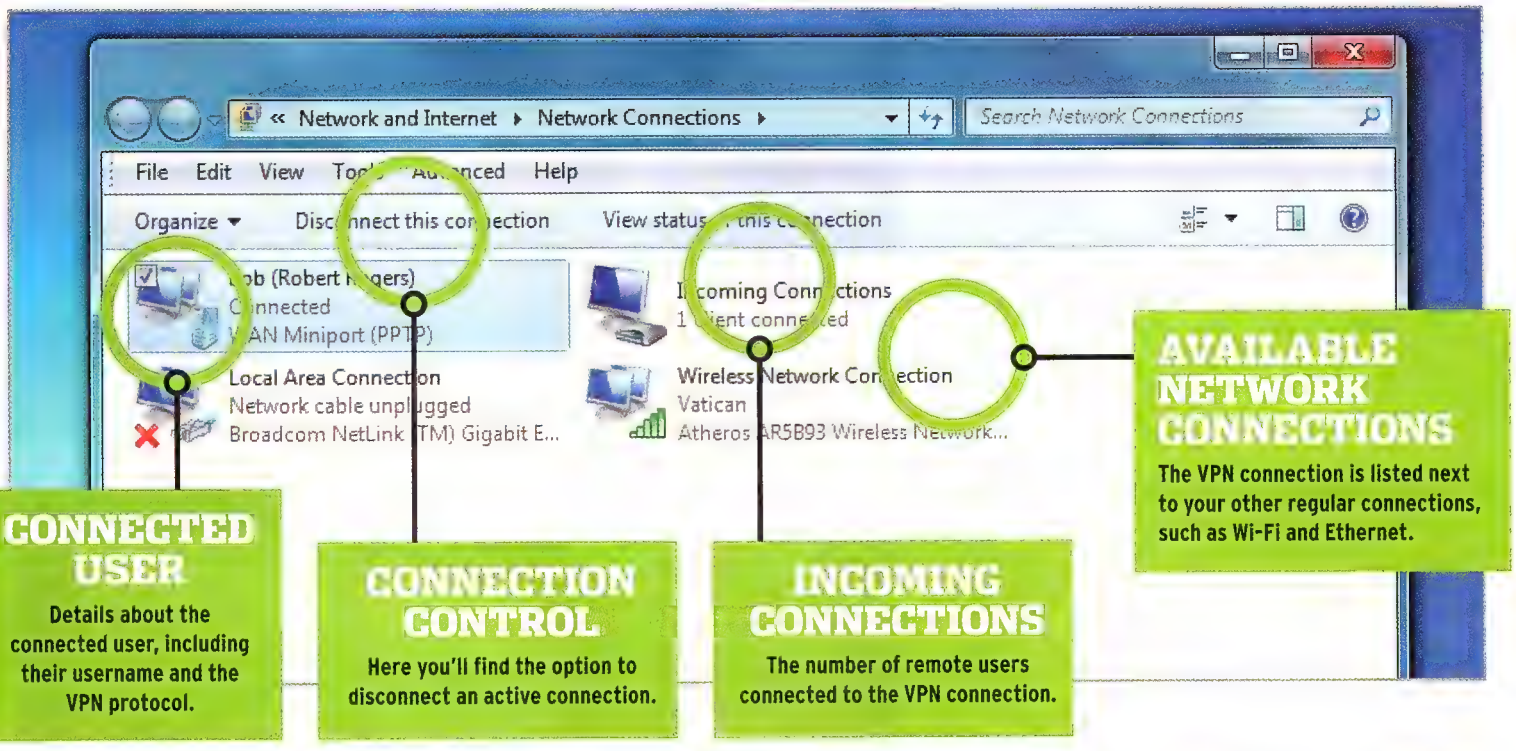
02 ADD A USER

You'll be shown a list of all the users on this machine. Select the user account you wish to allow connections to and from a remote computer. Since existing user accounts may have administrative privileges, you should create a new user with limited privileges specifically for accepting VPN connections. Click 'Add someone' and specify the account details of the new user.


Allow connections to this computer
Networking software allows this computer to accept connections from other kinds of computers
Select the check box next to each type of networking software that should be enabled for incoming connections.
Networking software:
Internet Protocol Version 6 (TCP/IPv6)
File and Printer Sharing for Microsoft Networks
QoS Packet Scheduler
Install...
Uninstall
Properties
Description:
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

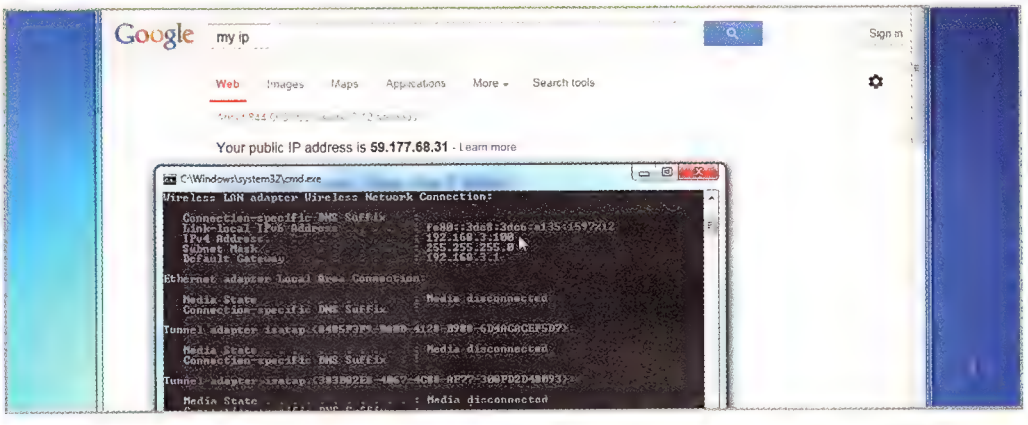
03 ENABLE PROTOCOLS

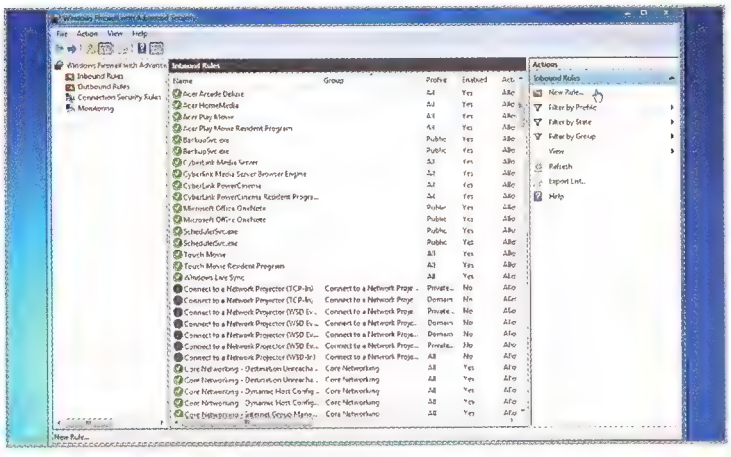
Click the 'Next' button after adding a user and then tick the 'Through the internet' checkbox, which defines how people will connect to this machine. Next, you'll be shown a list of network services that will be enabled for remote users. You can proceed with the default options or remove access such as 'File and printer sharing' if you don't want remote users to access them.


« Network and Internet ▸ Network Connections ▸
Search Network Connections
File Edit View Tools Advanced Help
Organize
Disconnect this connection
View status of this connection
Local Area Connection
Network cable unplugged
Broadcom NetLink (TM) Gigabit E...
Wireless Network Connection
Vatican
Atheros AR5B93 Wireless Network...
CONNECTED USER
Details about the connected user, including their username and the VPN protocol.
CONNECTION CONTROL
Here you'll find the option to disconnect an active connection.
INCOMING CONNECTIONS
The number of remote users connected to the VPN connection.
AVAILABLE NETWORK CONNECTIONS
The VPN connection is listed next to your other regular connections, such as Wi-Fi and Ethernet.

04 FIND YOUR IP

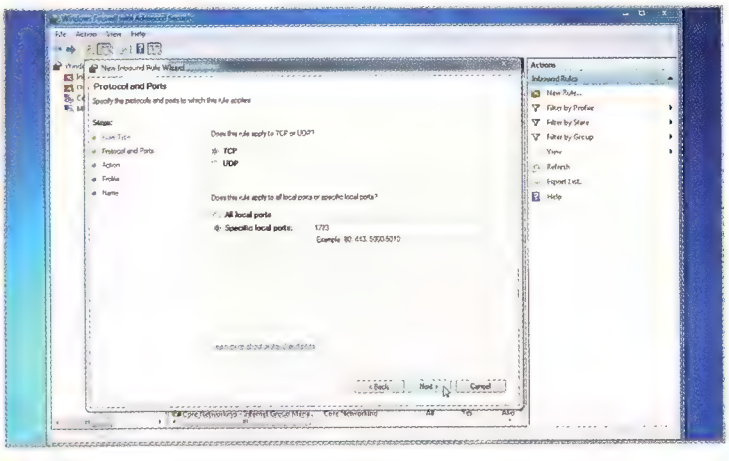
To allow VPN connections, you need to check your router and Windows Firewall. For that you need to know the private and public IP addresses of the Windows VPN server. Click 'Start' and type **cmd** . In the terminal window that opens, type **ipconfig** and note the address listed in the line starting 'IP v4 Address'. To find the server's public IP, go to **www.google.com** and type **My IP** .





05 CONFIGURE WINDOWS FIREWALL

To ensure Windows Firewall doesn't block VPN connections, you need to configure it. Begin by clicking 'Start > Control Panel' and type **firewall** into the search box. Click on 'Windows Firewall' and then 'Advanced Settings' in the left-hand pane. You might be prompted for your Administrator password before Windows launches Windows Firewall with Advanced Security.

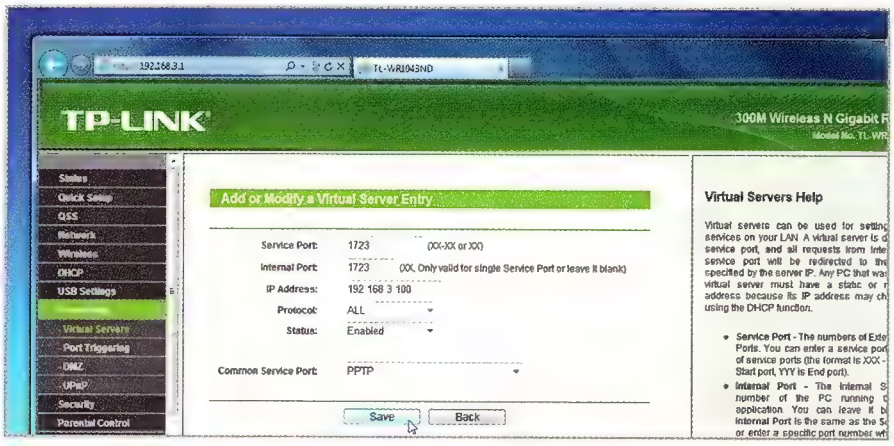


06 ALLOW VPN CONNECTIONS

Using this dialogue box, you need to add a new rule to allow traffic on the VPN port 1723. In the left-hand pane click 'Inbound rules' and then in the right-pane click 'New rule'. Next, toggle the 'Port' radio button on the wizard screen. In the next step, toggle the 'TCP' option and then enter the VPN port number in the space provided. Use the default options for the rest of the wizard.

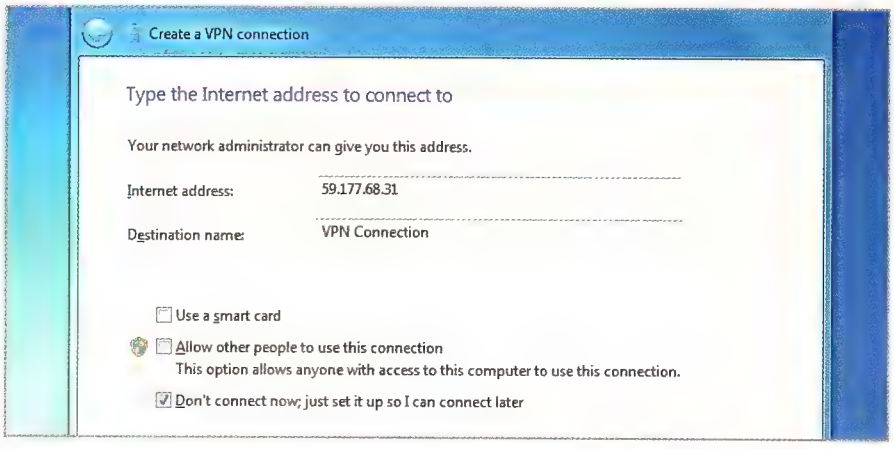
07 SET UP THE ROUTER

Now it's time to configure your router to forward connections from the internet to the server. The instructions for this step depend on your router. Check **www.portforward.com** for router-specific information. The two things you need to know are the VPN port number (1723) and the private IP address of the server that you found out in step 4. The server is now set up!



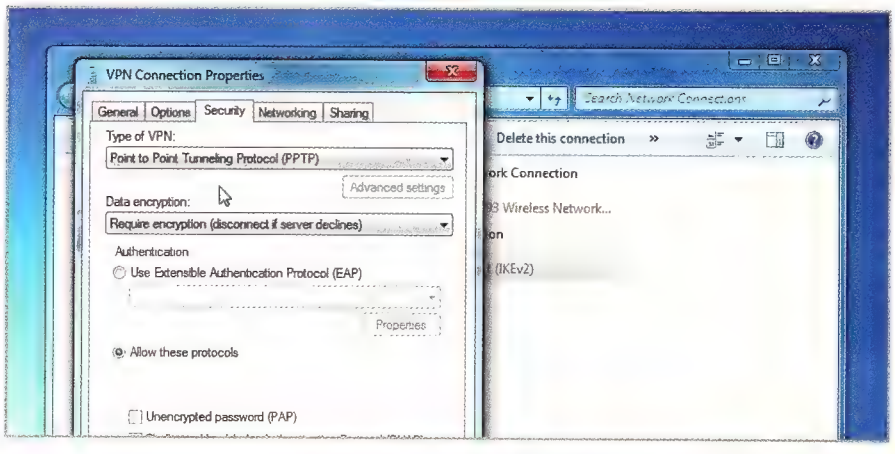
08 CONSTRUCT A CLIENT

When you want to connect to the VPN server from a remote location, you first need to create a new connection on the client machine. Go to 'Start', type vpn in the search box and select the first option that comes up. In the dialogue box that appears, type in the public IP address of the VPN server and give it a name. Don't forget to select the 'Don't connect now' checkbox.


Create a VPN connection
Type the Internet address to connect to
Your network administrator can give you this address.
Internet address: 59.177.68.31
Destination name: VPN Connection
Use a smart card
Allow other people to use this connection
This option allows anyone with access to this computer to use this connection.
Don't connect now; just set it up so I can connect later

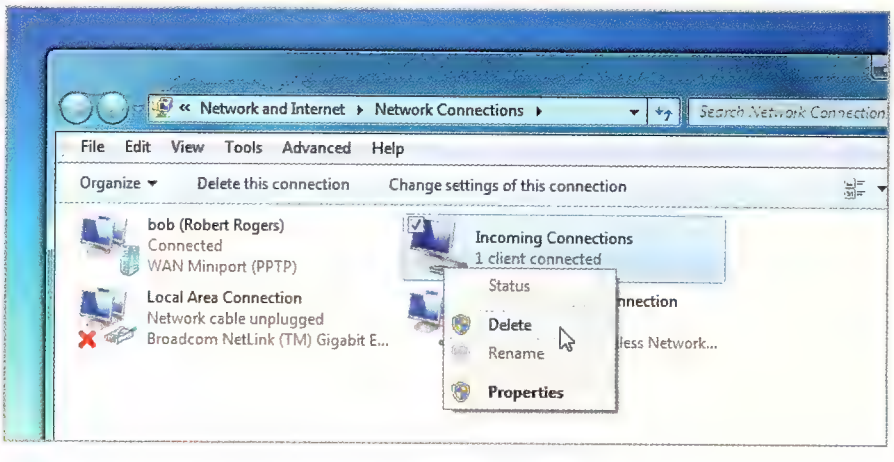
09 CONFIGURE CONNECTIONS

You'll then be prompted for the credentials of the VPN user you set up in step 2. The new VPN connection will then be listed next to other regular connections in the 'Network Connection' window. Right-click on this connection and select 'Properties'. Now switch to the 'Security' tab and select the 'PPTP' option from the 'Type of VPN' drop-down menu and click 'OK'.

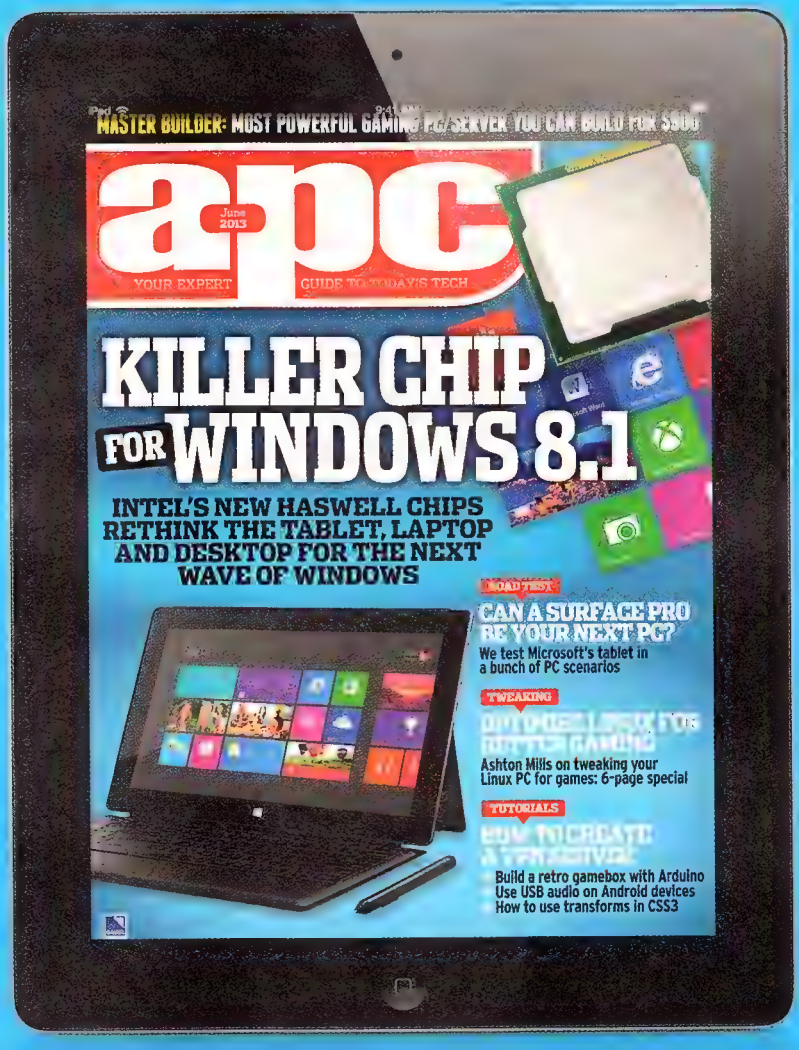


10 CONTROL ACCESS TO YOUR VPN

That's it! You can now double-click on this new connection, enter the password for the VPN user and click 'Connect'. You'll then be connected to the remote VPN server. On the VPN server, you can see the number of connected users in the 'Network connection' window. To disable VPN access to the server, simply right-click on the 'Incoming connection' item and select 'Delete'.



apc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We test Microsoft's tablet in a bunch of PC scenarios
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Ashton Mills on tweaking your Linux PC for games: 6-page special
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Master the Windows 8 desktop experience

Alex Cox says the Windows desktop has been around for 18 years and you use it every day, but it's still packed with hidden features that can improve your experience.

YOU'LL NEED THIS

WINDOWS 8

It goes without saying, but you'll need Microsoft's latest OS to follow along with these tips and tricks.

01 UNLOCK THE TASKBAR

Right-click the taskbar (the area at the bottom of the desktop, with your running programs on it) and untick 'Lock the Taskbar' to open it up for further experimentation.

02 GET MORE SPACE

Once you've unlocked the taskbar, you can make it bigger to give yourself more space for icons. Just hover your mouse over the top edge until it turns into an arrow cursor, then simply click and drag to expand or contract it to your specific requirements.

03 REARRANGE THE TASKBAR

With the taskbar unlocked, click an empty bit of it and then hold and drag it to the screen edge you want it to sit on. If you'd like to keep it locked on one side, you can use the taskbar's 'Properties' menu to select its location.

04 CHANGE ICON SIZES

Go back to the taskbar 'Properties' menu. The 'Use Taskbar icons' checkbox enables you to choose how large the various icons appear on your desktop.

05 ADJUST TASKBAR ICONS

Use the 'Taskbar buttons' menu in the taskbar 'Properties' to choose how icons on your taskbar are displayed. If you're used to working with Windows XP, try 'Combine when taskbar is full' for a more familiar view.

06 CUSTOMISE NOTIFICATIONS

Clicking the up arrow icon on the left-hand side of the notification area will display anything that's currently hidden. You can then click 'Customize' to show and hide more notifications and running programs.

07 CASCADE WINDOWS

Set windows to cascade and they'll be automatically arranged on top of each other, with enough space to click each one and switch between them. Right-click the taskbar and select 'Cascade windows'.

08 GET ORGANISED

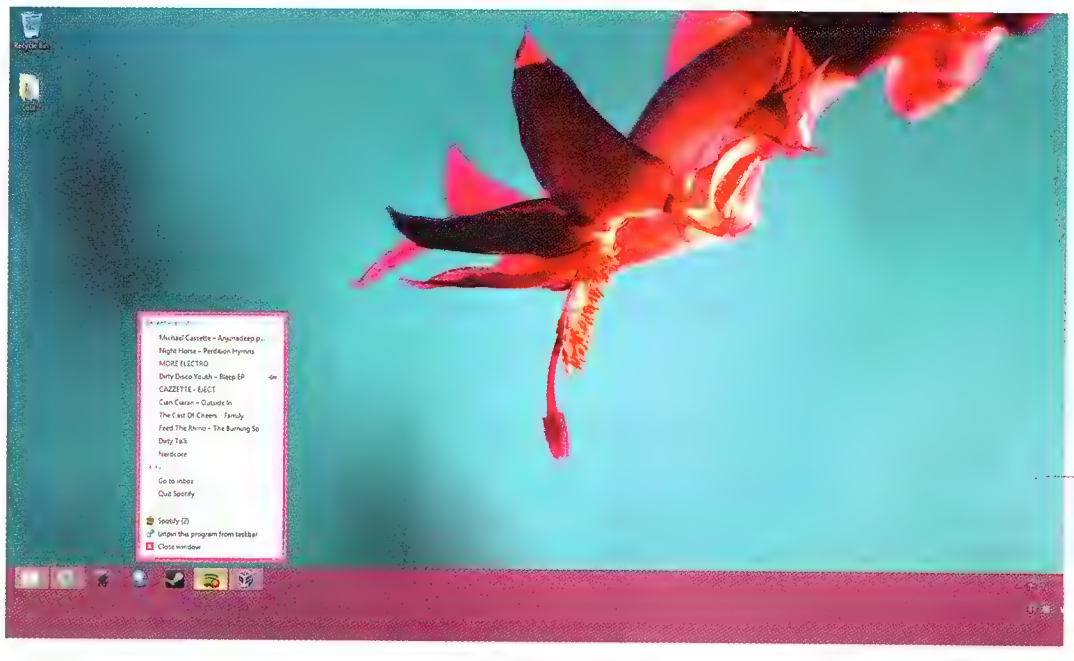
Stacking and viewing side by side is a really useful option – right-click the taskbar and select the appropriate option. You then can drag and snap windows into place.

09 LAUNCH A WINDOW

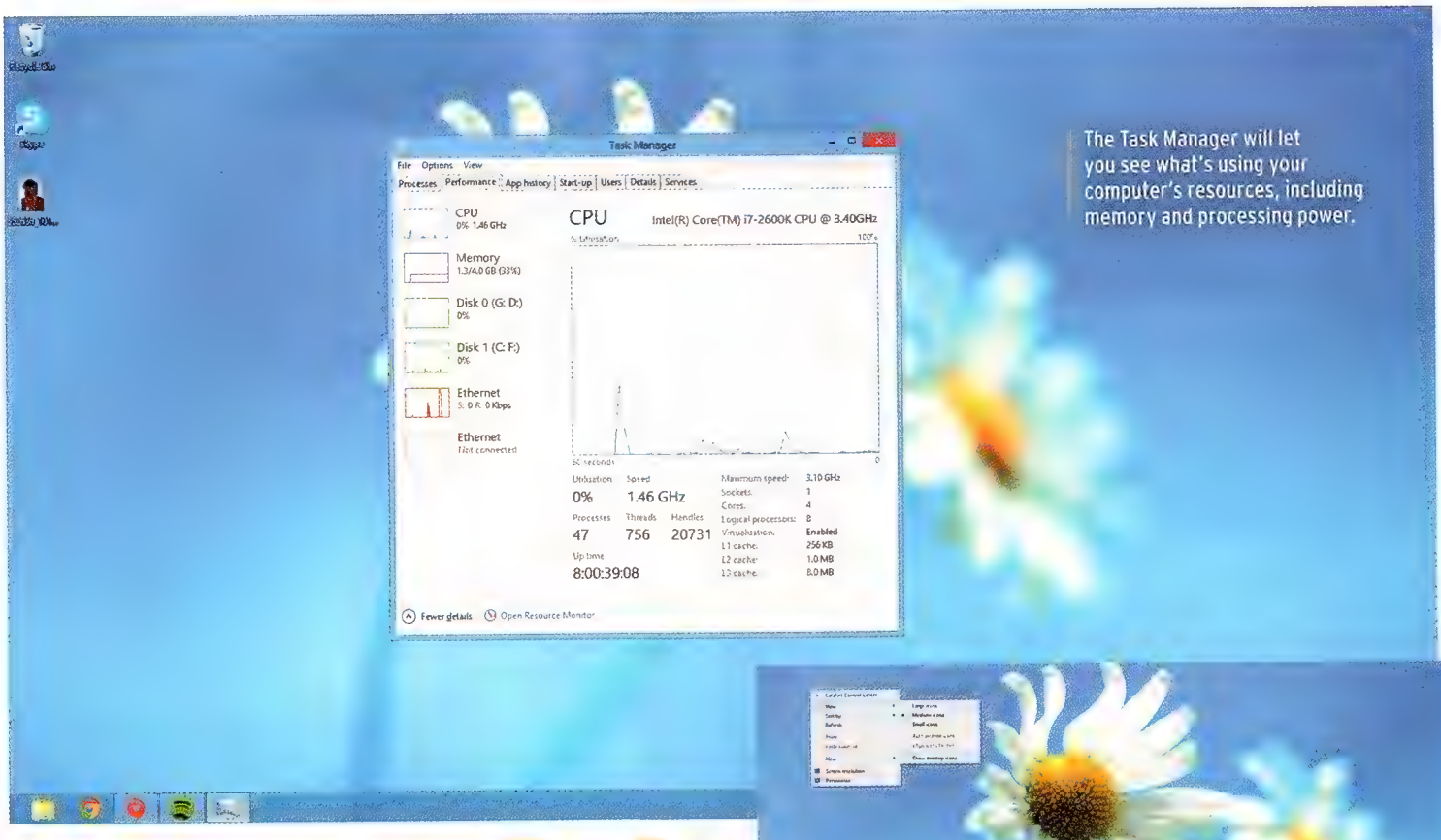
Did you know that you can launch a new window for any running program by simply holding the Shift key and clicking its icon on the taskbar? Well, you can! It's a really useful way to access your programs swiftly.

10 HIDE THE TASKBAR

Right-click the taskbar and select 'Properties'. There's an option here to 'Auto-hide the taskbar'. This means you can make the taskbar roll up out of the way automatically until you move your mouse to the edge of the screen it's sitting

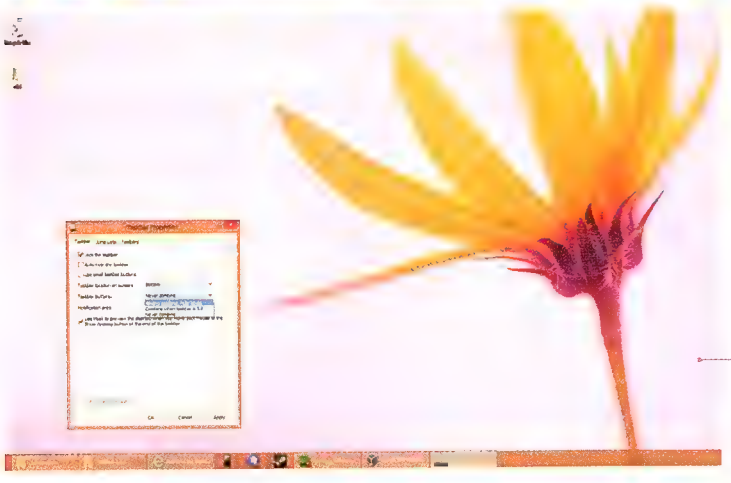


The Windows taskbar hides some powerful file management features.



The Task Manager will let you see what's using your computer's resources, including memory and processing power.

Organise those icons! Windows can sort your icons automatically using various criteria.



You can change the way icons are displayed on your taskbar quickly and easily to suit the way you work.

on. That way you can keep your screen free of clutter, but still retain access to your taskbar.

11 GET MORE TOOLS

Need to get your hands on the touch keyboard, the Internet Explorer address bar and more? All you have to do is right-click the taskbar and add the appropriate toolbar.

12 LINK TO A FOLDER

To create a link direct to a folder, right-click the taskbar, highlight 'Toolbars' and then select 'New Toolbar'. Choose a folder somewhere on your Windows 8 machine and you'll get a new icon on the taskbar that links you straight to its contents.

13 SEE AN OVERVIEW

Right-click the taskbar and open the 'Properties' menu. Check the box next to the sentence that says 'Use Peek', click 'Apply' and from then on you'll get a quick glance at your desktop whenever you hover your mouse in the bottom-right corner.

14 OPEN TASK MANAGER

Task Manager is a super-useful program that enables you to keep tabs on exactly what's going on with your PC. There are two quick ways to access it: press Ctrl+Shift+Esc together, or right-click the taskbar and select the appropriate option. While it's open, you'll see a new icon in your notification area that gives you an at-a-glance view of your computer's performance.

15 TIDY YOUR DESKTOP

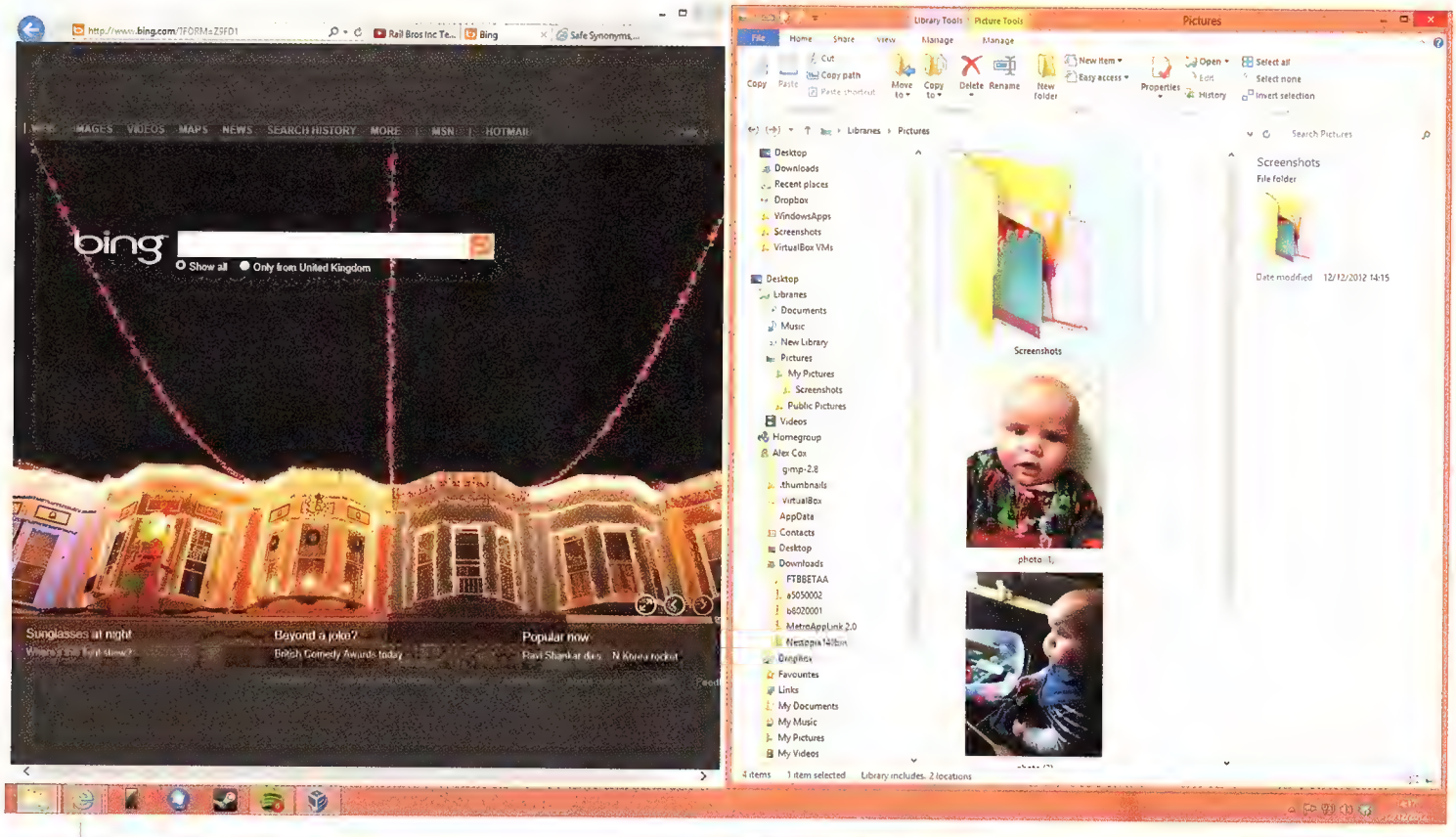
The desktop tends to be a dumping ground for files – ones you're just temporarily storing, ones you want to access quickly and ones you've just downloaded – which means it can quickly get cluttered. Right-click the desktop and select 'View > Small Icons' to shrink them down a bit, enabling you to fit more in the same amount of space.

16 ALIGN YOUR ICONS

The standard grid for icons keeps everything neat and tidy, but you might want to arrange your desktop icons with more precision. Right-click the desktop, select 'View' and uncheck 'Align icons to grid'. You can then click and drag to drop them wherever you like.

17 SNAP ICONS IN PLACE

What if you don't want icon-arranging precision and would prefer Windows 8 to do the job for you? That's fine, too! Checking the option



If you have a large screen, having two windows open at once is a great way to use that extra space efficiently.

'Auto arrange icons' under the 'Desktop View' menu forces your icons into a neat grid configuration. You can still drag them around to rearrange their order and position, but they automatically snap into place, going from top-left to bottom-right.

18 HIDE ICONS

Right-click the desktop, go to the 'View' menu and uncheck the option that says 'Show Desktop Icons'. All the icons on your desktop will disappear, leaving your desktop wallpaper unsullied by so many icons. Don't panic – your files and folders are still safe and sound, they're just hidden. Open an Explorer window and visit the 'Desktop' folder from there and you'll find all your hidden files waiting for you.

19 GET SORTED

Right-click on your desktop and hover your mouse over 'Sort by' – it will automatically swish your icons around based on whatever option you select. This isn't a permanent change, but bear in mind that it does mess up any arrangements you might have previously made.

20 CREATE DOCUMENTS

Your desktop is essentially just another kind of folder and as such, you can treat it the same as any other folder on your computer. That means you can create new documents, shortcuts and folders by right-clicking, hovering over 'New' and choosing the appropriate option. Making shortcuts is great for programs or files you use frequently.

21 OPEN THE CLOCK

Would you like more information about the time and date? Left-click on the clock on the taskbar to open up a detailed timepiece.

22 SEE TIME ZONES

Right-click on the clock, choose 'Adjust Date/Time' and then use the

Time for a change? Click the time on your taskbar to access an analogue clock and a nifty little calendar.

'Additional clocks' tab to add world time to the expanded view.

23 GO DIGITAL

If you've made the switch to Windows 8, when you move the mouse over to the right-hand side of your screen (or swipe in from the right), you'll be able to see the 'Start' screen's digital clock.

24 ADJUST THE TIME

By default the clock on your desktop is set automatically, but you can change it manually by right-clicking, selecting 'Adjust Date/Time' and clicking the appropriate button. This is handy if you're often late for appointments and want to set it a few minutes fast!

25 SET A NEW SOURCE

You can also change the source clock that sets your PC's time for you by using 'Adjust Date/Time'. Just select the 'Internet Time' tab and click the button there.

WHAT IS THE WORLD'S SMALLEST COMPUTER?

DISCOVER SOMETHING NEW

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LAUNCH ISSUE OUT NOW

Gaming on Linux

Ashton Mills explains how to tweak your Linux machine to improve its gaming performance.

YOU'LL NEED THIS

NVIDIA LINUX DRIVER

Head to **www.nvidia.com** and download the latest driver (for info on AMD on Ubuntu, see **tinyurl.com/fgcu4**).

CUSTOM KERNEL

We used the latest Zen kernel, 3.8.8-zen, which can be found at **tinyurl.com/c98fzd4**.

Now that Valve's digital distribution platform is here for Linux, along with a collection of native Linux titles, the penguin operating system is garnering an increasingly higher profile as a serious gaming platform.

As with Windows, there are some tips and tweaks you can use to improve the performance of Linux as a gaming system, but with a difference. The truth is that under Windows there's little you can actually do to improve performance: you don't have access to the code for the game binary, the OS or the drivers. Most Windows tweaks revolve around disabling unnecessary services or programs in an effort to free up memory or CPU time and any difference, if there is any, is often negligible. Mostly, the best you can do for a Windows system is to make sure you have the latest drivers installed. Or upgrade your hardware.

The same isn't true for Linux. While the games will still have precompiled binaries, the source code to Linux itself and especially the kernel is freely available. We're undoubtedly going to see a rise in stripped-down gaming-oriented distributions (including Valve's own version for its Steam Box, we expect), although you can do some of your own tweaks to improve performance on your own system, even for a desktop-oriented distribution like Ubuntu. With impressive results, too, as we'll get into later.

So here's our guide to optimising Linux for games.

STARTING WITH DRIVERS

Naturally, while open-source drivers exist for both Nvidia and AMD cards, and these work perfectly for the desktop, better performance can be obtained by using the latest official binary drivers.

Ubuntu makes it easy for you to switch to these using the 'Additional Drivers' option in the 'Software Sources' dialogue – simply type `software` in the Unity bar to find and launch 'Software Sources', click on the 'Additional Drivers' tab and select which driver you want to use. You may get a selection that includes the latest untested driver (not necessarily beta, simply not tested stable for Ubuntu's repositories) or the latest tested version.

Of course, this is the easy way. You can also install the very latest driver direct from the manufacturer, which can often be quite useful, as the Ubuntu repositories can often be a number of versions behind.

As our test system uses an Nvidia card and the process is a little more complicated than for AMD, we'll cover how to do this for Nvidia here. For a great guide on installing the latest drivers from AMD on Ubuntu, see the community how-to at **tinyurl.com/fgcu4**.

01 If you're already using one of the Nvidia drivers from Ubuntu's repositories, first disable this driver by going to the 'Additional Drivers' tab in 'Software Sources'.

02 Head to **www.nvidia.com** and download the latest Nvidia Linux driver. Just as with Windows, you can install the latest WHQL equivalent or the very latest beta. You'll be asked to download a file ending in '.run'.

03 Reboot and from the Grub menu, choose the 'Safe Mode' version of your current kernel. You may need to click on 'Advanced options' first.

04 From the 'Safe Mode' screen, select to free up disk space or check your disk; either will remount your file system in read/write mode (it's good to check every now and then!).

06 Choose the 'Root' option to drop to a command prompt with root privileges and then change to the directory where you saved the Nvidia driver file.

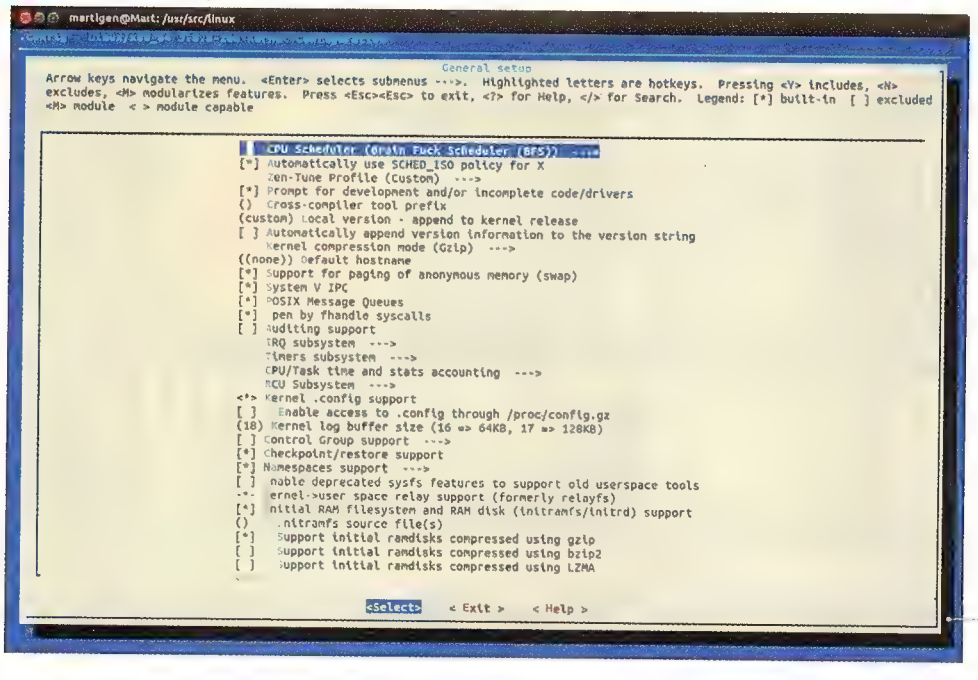
07 Run `chmod a+x` to make it executable, followed by launching it; for example, `./NVIDIA-Linux-x86_64-310.44.run`. Select 'Yes' to all prompts during install.

08 Finally, the Nvidia driver won't load while the open-source Nouveau driver is present, but rather than uninstalling it, simply prevent it from loading by running `nano /etc/modprobe.d/blacklist.conf` and adding `blacklist nouveau` to the end of the file. Press Ctrl+X to save.

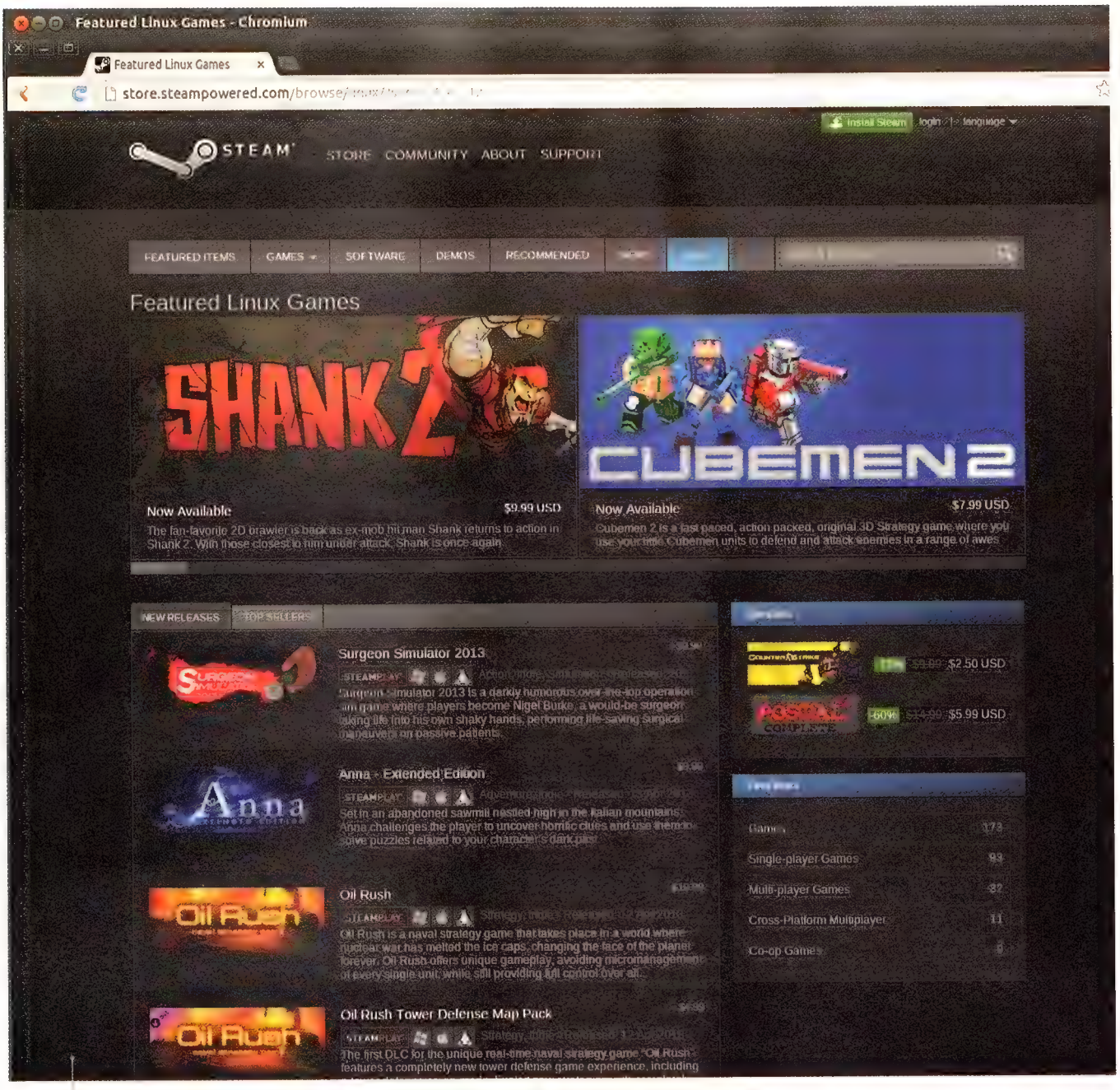
09 Run the command `reboot` to reboot with the driver installed.

Note that if you ever want to uninstall the driver and revert to Nouveau or an Ubuntu repository driver, simply repeat the process above, but when running the Nvidia installer, append the switch `--uninstall` and then delete Nouveau from the 'blacklist.conf' file.

Finally, if you plan to also compile your own kernel, which we'll cover next, wait until you've installed the new kernel before installing the latest driver, otherwise you'll have to do it again afterwards!


martigen@Mart: /usr/src/linux
General setup
Arrow keys navigate the menu. <Enter> selects submenus --->. Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < > module capable
CPU Scheduler (Brain Fuck Scheduler (BFS)) --->
[*] Automatically use SCHED_ISO policy for X
Zen-Tune Profile (Custom) --->
[*] Prompt for development and/or incomplete code/drivers
() Cross-compiler tool prefix
(custom) Local version - append to kernel release
[ ] Automatically append version information to the version string
Kernel compression mode (Gzip) --->
((none)) Default hostname
[*] Support for paging of anonymous memory (swap)
[*] System V IPC
[*] POSIX Message Queues
[*] open by fhandle syscalls
[ ] Auditing support
IRQ subsystem --->
Timers subsystem --->
CPU/Task time and stats accounting --->
RCU Subsystem --->
<*> Kernel .config support
[ ] Enable access to .config through /proc/config.gz
(18) Kernel log buffer size (16 => 64KB, 17 => 128KB)
[ ] Control Group support --->
[*] Checkpoint/restore support
[*] Namespaces support --->
[ ] Enable deprecated sysfs features to support old userspace tools
[*] Kernel->user space relay support (formerly relayfs)
[*] Initial RAM filesystem and RAM disk (initramfs/initrd) support
() initramfs source file(s)
[*] Support initial ramdisks compressed using gzip
[ ] Support initial ramdisks compressed using bzip2
[ ] Support initial ramdisks compressed using LZMA
<Select> < Exit > < Help >

Configuring the Zen kernel before compiling.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The Linux catalogue of games is steadily growing.

COMPILING A CUSTOM KERNEL

It's long been known that running an optimised kernel can improve performance and like Windows, which needs to support the lowest common denominator, most Linux distributions use generic kernels configured to support and run on the widest range of hardware. But unlike Windows, you can change this.

Compiling your own kernel is a fun and great learning experience if you haven't done it before. You have a number of options available: you can use vanilla kernel source (upon which all distribution kernels are based), use Ubuntu's patched kernel source, or go hardcore and grab a performance patched kernel such as the Zen kernel.

Of course, the real question is what difference can a custom kernel make, especially when a game is still a precompiled binary. As it happens, more than you might think – see our discussion of the benchmarks results on page 74.

Since the process of compiling a vanilla kernel or a patched kernel is the same, and we want to test whether using an optimised kernel makes a difference to games, we'll demonstrate using the latest build of the Zen kernel (3.8.8-zen at the time of writing).

01 First head to **tinyurl.com/c98fzd4** and click on the 'Zip' button to download a ZIP archive.

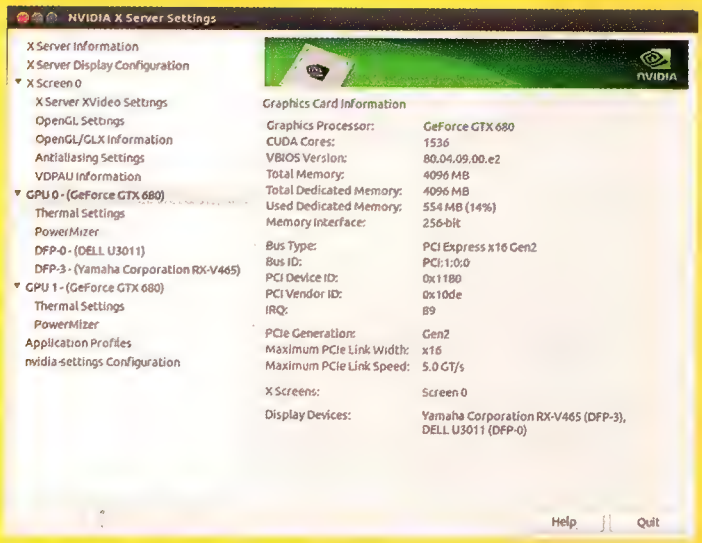
PLAYING NICE

Another tweak you can use with games is to raise the CPU priority of both the game and the X server. On the whole, modern kernels do a better job than they used to in making sure the X server maintains priority for desktop use, but you can boost this and boost the game's process using the `renice` command. First determine the process ID of the X server and your game; for example, by running `ps ax |grep X` for the X server. Then, `renice` the X server and the game's process, each using the syntax: `sudo renice -10 [process ID]`. It's a good idea not to go below -10. There are other processes in your system, some integral to its operation, which will already have had `renice` applied during boot to ensure they have priority, and may in fact be detrimental to performance if you prioritise a game above them. Generally, though, unless your system is already quite busy, you shouldn't have a need to do this. However, it can be useful if you're multitasking CPU-intensive apps in the background (folding, or similar), where you can then prioritise a game to not be impacted by background work.

NVIDIA TWEAKS

There are a number of driver tweaks you can make with the Nvidia driver to improve performance, if your hardware supports them.

* **MSI interrupts**. Linux supports MSI PCIe interrupts, a more advanced and slightly faster method for triggering interrupts, which some hardware will use by default. This can include network controllers, sound cards and USB controllers. Nvidia cards also sport it, but it's not enabled by default, as support depends on the system. However, most relatively modern PCs should work fine. To tell the Nvidia driver to use MSI interrupts, type `sudo nano /etc/modprobe.d/nvidia.conf`, add the line `options nvidia NVreg_EnableMSI=1` and then save. Reboot and to check your Nvidia cards now use MSI-X, simply run `cat /proc/interrupts |grep nvidia`.
* **PCIe 3.0**. If you're using a late Sandy Bridge or Ivy Bridge CPU and 600 series or higher GPU, you have access to the much faster bandwidth of PCIe 3.0. To enable PCIe 3.0 support, simply edit the /etc/modprobe.d/nvidia.conf as in the MSI tip above, add the line `options nvidia NVreg_EnablePCIeGen3=1` and reboot. Note that if you're using a Sandy Bridge CPU, which isn't officially certified for PCIe 3.0, you may suffer instability. If so, simply revert the change.
* **SLI**. While the Nvidia Linux desktop control panel is feature-rich, it lacks the ability to enable SLI for those with more than one card. However, SLI has long been supported under Linux and Nvidia's own terminal-based configuration tool makes it easy to toggle. To enable SLI, open a terminal and run `sudo nvidia-xconfig --sli=auto`. What this command does is it simply adds 'Option "SLI" "AUTO"' to the /etc/X11/xorg.conf file. Other options include 'on', 'AFR', 'SFR' and of course, 'off' to disable.



Getting better, but still lacking some options found in its Windows counterpart.

02 Open a terminal, run `sudo -s` and grab a drink. There's a bit of work to be done.

03 Install the necessary dependencies for compiling a kernel with `apt-get install kernel-package libncurses5-dev`.

04 Next, run `cd /usr/src` and then decompress the kernel ZIP file with `unzip /home/[username]/Downloads/zen-kernel-3.8-master.zip` (where [username] is your username, if you saved it in your 'Downloads' directory).

05 Set up a symlink for Linux for the kernel as the default source with `ln -s zen-kernel-3.8-master linux`.

06 Change to the source directory, `cd linux`.

07 Run `make menuconfig`.

Next, it's time to configure the kernel. Use the cursor keys to navigate, spacebar to select and Esc to move back a menu. There are *hundreds* of options in the kernel, but we only need to toggle a few.

01 Under 'General Setup', select 'Automatically use SCHED_ISO policy for X'.

02 Under 'Processor type and features', select your CPU type under 'Processor Family'.

03 Scroll down and make sure 'Preemption Model' is set to 'Voluntary Kernel Preemption'.

04 Scroll further down to 'Timer Frequency' and set this to 1,000Hz.

05 Press Esc until you're asked to quit and save your configuration.

Most of the other options for the Zen kernel default to performance options; however, at a later date it can be worth going over and learning about many of the features you can change, and compiling in driver support just for your specific hardware.

A quick discussion on timer frequency: this option determines how frequently the kernel will address interrupts. On the one hand, doing this too frequently slows down actually getting work done (the time spent checking is time spent not working). On the other, it allows the kernel to be more responsive to events, including input from the user. Hence, a high timer frequency is recommended for use with real-time systems and workloads that prioritise interactivity; for example, your average desktop. It should also help games, especially in regard to input response (reduced input lag) and reducing frame rate jitter (providing smoother gameplay).

Now we'll do something that's probably going to be frowned upon by kernel developers, but will ensure we get proper CPU tuning applied – edit the 'Makefile CFLAGS'. This allows the GCC compiler to produce optimised code specific to your CPU's architecture. There are different ways of doing this, but a simple method is to run `nano /usr/src/linux/arch/x86/Makefile`, press Ctrl+W to search and enter `-pipe` to find the correct line. In front of `-pipe`, add `-march=native -mtune=native`.

This lets GCC determine and optimise for your CPU architecture on its own. However, if you want to be specific you can specify your exact architecture; for example, Sandy Bridge-based Core i7 CPUs from Intel should use `-march=corei7-avx`. To determine what flags represent your architecture, see the GCC manual itself at **tinyurl.com/boayprd**.

Save the file and then do the following to compile the kernel:

```
make-kpkg clean
make-kpkg kernel_image kernel_headers
```

This will take a while, but you can speed it up by spreading the workload across all your CPU cores. Since almost everyone has a quad-core chip these days, simply run `export CONCURRENCY_LEVEL="4"` before the above commands. If you have a dual-core, use a concurrency level of 2; for a hex-core, fire it up to 6.

Once compiled, you'll find two new '.deb' files in the /usr/src directory – install them and update the Grub boot manager like so:

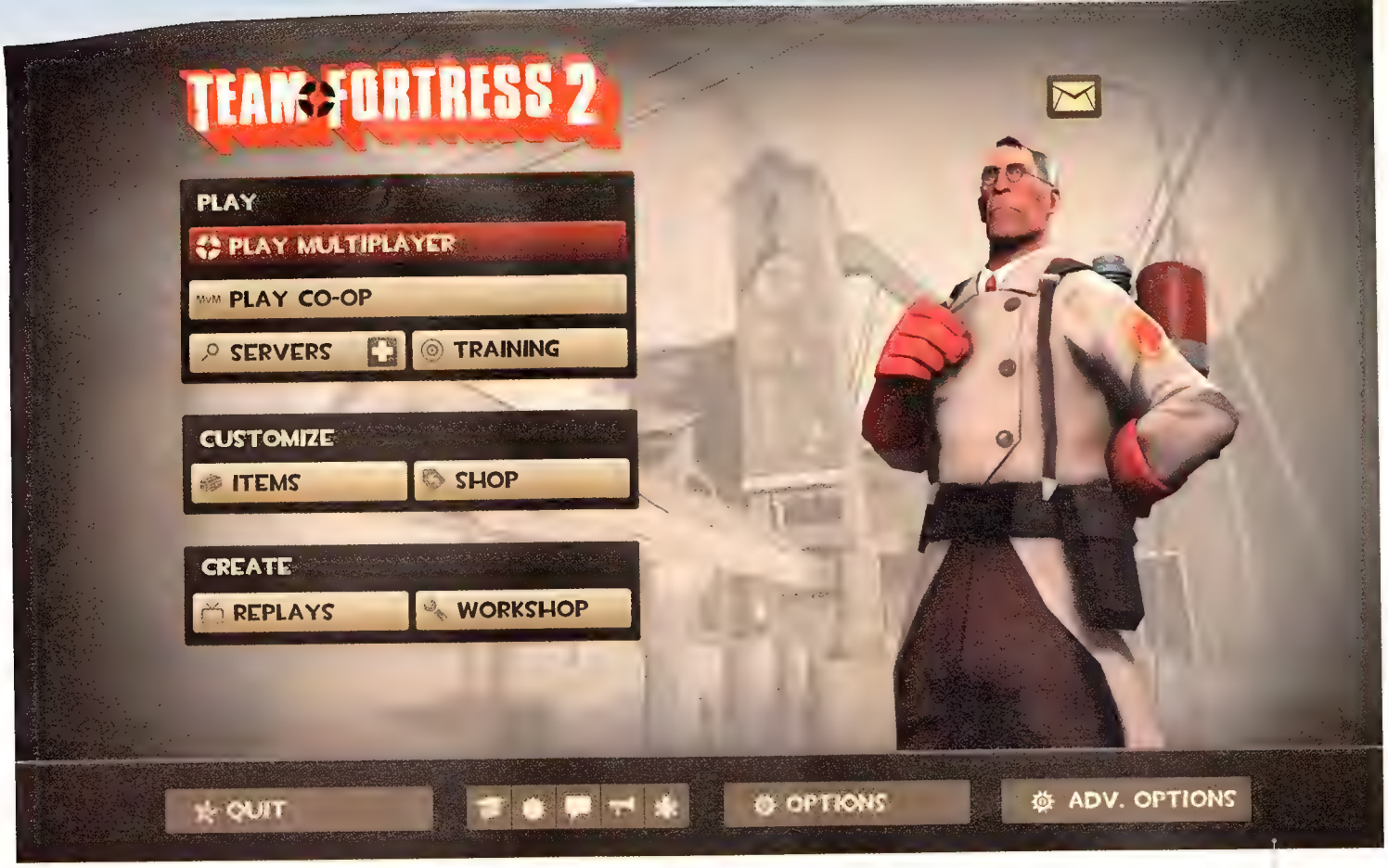
```
cd /usr/src
dpkg -i *.deb
update-initramfs -c -k all
update-grub
```

And that's it, you've compiled and installed a custom optimised performance kernel! Reboot and enjoy. Note that if you've installed Nvidia or AMD drivers manually, you'll need to boot your kernel and reinstall them.

Finally, if you want to compile vanilla kernel sources or those from Ubuntu, the process is the same. To grab the kernel source for your currently running Ubuntu kernel, first change to the /usr/src directory, run `apt-get source linux-image-$(uname -r)` and then simply follow the above instructions to configure, compile and install.

SEPARATE X SCREENS

If you've come from Windows, it's easy to forget that the GUI with Linux isn't intimately tied to it. Linux makes it easy to run headless systems by



Team Fortress 2 is the first of Valve's Source-based games to be ported to Linux.

```
root@Mart: /usr/src/linux
for file in ChangeLog  Control  Control.bin86 config templates.in rules; do
        cp -f  /usr/share/kernel-package/$file ./debian/;
done
for dir  in Config docs examples ruleset scripts pkg po;  do
        cp -af /usr/share/kernel-package/$dir  ./debian/;
done
test -f debian/control || sed          -e 's/=V/3.8.8-zen/g'  \
              -e 's/=D/3.8.8-zen-10.00.Custom/g'          -e 's/=A/amd64/g'  \
              -e 's/=SA//g'  \
              -e 's/=I//g'                                \
              -e 's/=CV/3.8/g'                            \
              -e 's/=M/Unknown Kernel Package Maintainer <unknown@unconfigured.in.etc.kernel-pkg.conf>/g'          \
              -e 's/=ST/linux/g'       -e 's/=B/x86_64/g'     \
             /usr/share/kernel-package/Control > debian/control
test -f debian/changelog ||  sed -e 's/=V/3.8.8-zen/g          \
            -e 's/=D/3.8.8-zen-10.00.Custom/g'         -e 's/=A/amd64/g'       \
            -e 's/=ST/linux/g'      -e 's/=B/x86_64/g'          \
            -e 's/=M/Unknown Kernel Package Maintainer <unknown@unconfigured.in.etc.kernel-pkg.conf>/g'          \
             /usr/share/kernel-package/changelog > debian/changelog
chmod 0644 debian/control debian/changelog
test -d ./debian/stamp || mkdir debian/stamp
make -f debian/rules debian/stamp/conf/kernel-conf
make[1]: Entering directory `/usr/src/zen-kernel-3.8-master'
====== making target debian/stamp/conf/kernel-conf [new prereqs: ]======
make    ARCH=x86_64 \
                oldconfig;
make[2]: Entering directory `/usr/src/zen-kernel-3.8-master'
scripts/kconfig/conf  --oldconfig Kconfig
#
# configuration written to .config
#
make[2]: Leaving directory `/usr/src/zen-kernel-3.8-master'
make    ARCH=x86_64 prepare
make[2]: Entering directory `/usr/src/zen-kernel-3.8-master'
scripts/kconfig/conf  --silentoldconfig Kconfig
make[2]: Leaving directory `/usr/src/zen-kernel-3.8-master'
make[2]: Entering directory `/usr/src/zen-kernel-3.8-master'
  SYSHDR  arch/x86/syscalls/../include/generated/uapi/asm/unistd_32.h
  SYSHDR  arch/x86/syscalls/../include/generated/uapi/asm/unistd_64.h
  SYSHDR  arch/x86/syscalls/../include/generated/uapi/asm/unistd_x32.h
  SYSTBL  arch/x86/syscalls/../include/generated/asm/syscalls_32.h
  SYSHDR  arch/x86/syscalls/../include/generated/asm/unistd_32_ia32.h
  SYSHDR  arch/x86/syscalls/../include/generated/asm/unistd_64_x32.h
  SYSTBL  arch/x86/syscalls/../include/generated/asm/syscalls_64.h
  HOSTCC  arch/x86/tools/relocs
  WRAP    arch/x86/include/generated/asm/clkdev.h
  CHK     include/generated/uapi/linux/version.h
  UPD     include/generated/uapi/linux/version.h
  CHK     include/generated/utsrelease.h
  UPD     include/generated/utsrelease.h
  CC      kernel/bounds.s
  GEN     include/generated/bounds.h
  CC      arch/x86/kernel/asm-offsets.s
  GEN     include/generated/asm-offsets.h
  CALL    scripts/checksyscalls.sh
make[2]: Leaving directory `/usr/src/zen-kernel-3.8-master'
echo done > debian/stamp/conf/kernel-conf
make[1]: Leaving directory `/usr/src/zen-kernel-3.8-master'
make -f debian/rules debian/stamp/conf/full-changelog
```

Compiling a custom kernel. Yes, this is as exciting as it gets!

simply not loading the X server – the basic framework all graphical desktops on Linux use. Conversely, you can run more than one X server and have multiple independent desktops if you so desire, each separate from the other.

It's long been a gaming tweak for Linux to launch games in their very own X server, thereby bypassing the desktop graphics framework of your desktop, such as Compiz and Ubuntu's Unity. The theory is that the screen has unrivalled access to the GPU and won't be slowed down by running on top of a 3D-enabled interface. To some extent, this has been true in the past, although in recent releases of Ubuntu things have certainly improved.

Launching a game in its own X screen is simple enough – simply use the `xinit` command. For example, `xinit ./heaven -- :1` runs the Heaven benchmark we used in our testing in its own server. The `--` flag specifies options that the server itself will follow, while `:1` tells the X server to launch in that display number. By default, the first X server on the system is screen zero (`:0`) and this is assigned in Ubuntu to the hotkey Ctrl+Alt+F7. The second screen `:1` will be found under Ctrl+Alt+F8 and when you first issue the command, you'll automatically be taken to the new screen. You can then switch between your desktop and the full-screen game by simply switching between Ctrl+Alt+F7 and Ctrl+Alt+F8. You can have even more screens if you wish, though there are limited hotkeys.

If you get an error along the lines of "User not authorized to run the X server" you need to make a quick edit for permissions. Run `sudo nano /etc/X11/Xwrapper.config` and change `allowed_users=` from `console` to `anybody` , and then save the file.

You should note that running games from Steam this way requires you to either launch Steam using this method and then simply launch games from within Steam, or specify the absolute path to the game when launching it. Alternatively, since Steam is often required as a form of DRM, you can launch a game directly via Steam's ID system. For example, to launch FTL:

```
xinit /usr/bin/steam steam://rungameid/212680 -- :1
```

Note the full path to Steam is required, as your new X server doesn't inherit the path of the shell. Don't know what the Steam ID of a game is? Just right-click on a game in Steam and select to create a desktop shortcut; you'll find the ID in there.

To close the X screen, simply press Ctrl+C in the window where you ran `xinit` . Obviously, some of this can be automated through scripts and who knows? Perhaps Steam for Linux will make it possible to launch games in their own server at a later date.

But does it make a difference? We had high hopes for this, although in our testing, it's not really significant. The benchmark results were *marginally* higher when running in their own window, but not so much that we felt a need to include them in the results. Still, it may depend on which distribution you're using and the underlying engine driving your desktop (we haven't tested with KDE, for example), so feel free to experiment yourself.

BENCHMARK RESULTS

You'll see in the results the difference a customised kernel using the latest Nvidia 310.44 drivers makes on an Ubuntu 12.10 desktop. The open-source Nouveau drivers weren't tested as they can't currently match the performance of the official drivers for gaming. The test system is an Intel Core i7-3970X with 16GB of RAM and a GTX 680 4GB. The Windows tests are a reference point and were done using Windows 8 and the 314.22 drivers.

Looking at the Linux results first, the custom kernel has a clear impact on performance for the Heaven and Valley benchmarks on the Basic preset, by roughly 20%. The more demanding Extreme preset for both reveals a smaller lead, but is nevertheless consistently faster. It also shows the difference between being GPU-bound and CPU-bound: in the Extreme preset the CPU is waiting for the GPU, but in the Basic preset the GPU is rendering as fast as the CPU can feed it; here, the custom kernel does a better job keeping it fed. This is especially true with regards to the all-important minimum frame rate, when the benchmark is at its most demanding.

The *Team Fortress 2* results also show the custom kernel to be faster, but by a smaller margin. Testing at a lower resolution to ensure the system is CPU-bound doesn't change the lead all that much (in fact, variability – consistency of frames – appears to normalise), which is likely a result of the older Source engine upon which it's based. The engine is so fast on modern hardware that even 1,920 x 1,080 doesn't take a big hit.

Comparing Linux to Windows will see it taking the lead across the full set of benchmarks, which is no surprise, considering the maturity of the platform for gaming. However, there are some noteworthy exceptions – at the Extreme presets for Heaven and Valley, the custom kernel Linux maintains parity, especially with regards to minimum frames. In fact, it maintains these across the board, indicating the average and maximum frames may be more a function of the maturity of the Linux Nvidia drivers.

For the *Team Fortress 2* benchmarks, Windows again maintains a higher average fps rate, although Linux provides a more consistent experience with less variability, and even more so with the custom kernel.

TEST RESULTS

Benchmarks	Windows	Linux – Ubuntu kernel	Linux – Custom kernel
Heaven 4.0 (Basic preset)			
Average fps	128	104	121
Minimum fps	32	25	33
Maximum fps	248	193	227
Heaven 4.0 (Extreme preset)			
Average fps	41	40	42
Minimum fps	22	13	16
Maximum fps	90	99	100
Valley 1.0 (Basic preset)			
Average fps	122	79	108
Minimum fps	39	34	38
Maximum fps	201	145	182
Valley 1.0 (Extreme preset)			
Average fps	55	47	48
Minimum fps	26	26	28
Maximum fps	102	82	87
Team Fortress 2 (1,920 x 1,080)			
Average fps	206	169	190
Variability	41	37	32
Team Fortress 2 (1,024 x 768)			
Average FPS	232	201	215
Variability	46	44	43

Note: For all scores higher is better, except Variability where lower is better.

GAME ON

It can be fun to tweak and squeeze more performance from your machine, but the fact that you can achieve a 20% performance boost by doing so is significant and something not possible with Windows. It also shows that Linux is ready for prime time as a gaming platform, even if there's still work to be done bringing its drivers up to date.

This is interesting to consider, as it means any improvements in the drivers to match Windows' maturity will only put Linux ahead. Hopefully, we'll also see gaming-oriented kernels and unique Steam for Linux features to make it easier to enjoy games on the penguin platform. And with the Steam Box on the horizon and the buzz it will generate, we're pretty sure it's only a matter of time.

Steam on Linux looks, feels and acts just the same as the Windows version.

Ooh, purty. The Valley benchmark.

Control your Mac or PC from your iPad

Matthew J.C. Powell shows you how to use a program called iTeleport Connect to do this.

YOU'LL NEED THIS

ITELEPORT CONNECT

You can download the program from **www.iteleportmobile.com/start**.

ITELEPORT APP

You'll find the iPad/iPhone app in the App Store.

The iPad is a versatile beast and has come to replace a laptop in many people's lives. However, there are some things it still can't do, like running desktop applications. If you need access to files or programs on your desktop computer from wherever you happen to be though, the iPad can handle it.

We've all done it at one time or another: headed out to a meeting or presentation and left some crucial file on the computer at home or the office, rather than copying it over to the iPad. Wouldn't it be handy to be able to log in to your computer remotely, email yourself the file and collect it on the device you've got right there with you? The good news is you can. The better news is, it's really easy.

In this tutorial, we'll be using iTeleport for iPad, a $20.99 application available from the App Store. There's also a $24.99 Universal version that runs on both iPhone and iPad and supports the Windows RDP sharing protocol as well as VNC. There are other apps out there, of course (see the 'Other control apps' box opposite). We'll also primarily be talking about controlling a Mac, since that's what iTeleport was originally designed for. However, the majority of the information herein will be the same, regardless of what OS you're controlling.

iTeleport uses the VNC (Virtual Network Computing) protocol to share screens between devices. VNC is built into OS X (or at least, it has been for the past few versions), although it's not native to Windows. If you want to control a Windows PC with iTeleport, you should either get the RDP version of iTeleport or install a VNC client (such as RealVNC) on your Windows machine.

In either case, you need to install a program called

A FEW NEAT TRICKS

MULTISCREEN SCREENSHOT

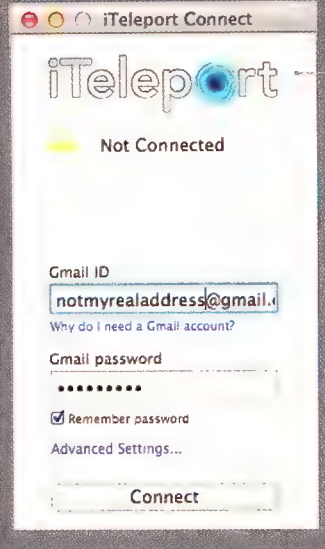
If you have multiple displays hooked up to your Mac, taking a screenshot only takes a shot of one display at a time. Using iTeleport, you can take a shot of all of them at once. Tap the cog icon for options, then 'Take Screenshot' and then 'Upload Screenshot'. An email will be sent to your Gmail account (the one you use for iTeleport Connect) with a link to download the image.

COPY & PASTE

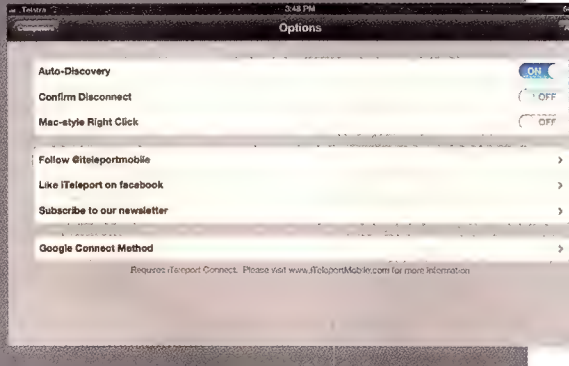
Want to copy a block of text from your iPad to your Mac? Select and copy it in whatever iPad app you're using, fire up iTeleport and log in to your Mac. Place your cursor where you want to paste the text, then tap in the text entry field above the keyboard and select 'Paste'. The pasted text should appear on your Mac's screen. If you're using a Windows machine connected with RDP, you can copy from the Windows machine back to the iPad using similar steps. Unfortunately, the VNC protocol doesn't support that type of copying.

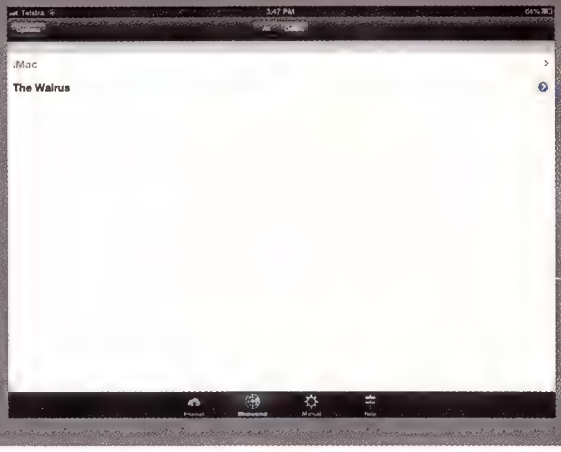
POWER FOR POWERPOINT

If you're giving a presentation and you want to move around rather than standing in front of your Mac, you can use iTeleport even if there's no internet connection. Just go to the 'AirPort' menu on the Mac, select 'Create Network' and set up an ad hoc Wi-Fi network. Fire up iTeleport on the iPad, tap on 'Discovered' and presto – there's your Mac, ready to be controlled.



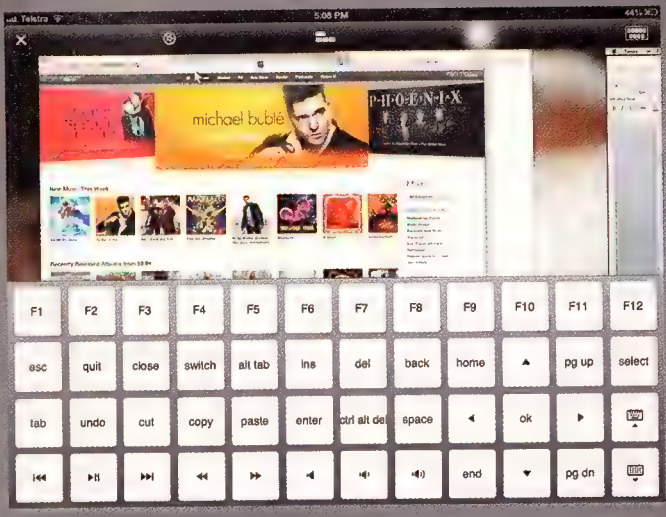
iTeleport Connect is a client program for Mac or Windows that saves you the trouble of configuring DNS and port forwarding. Plus your connection is encrypted for security.



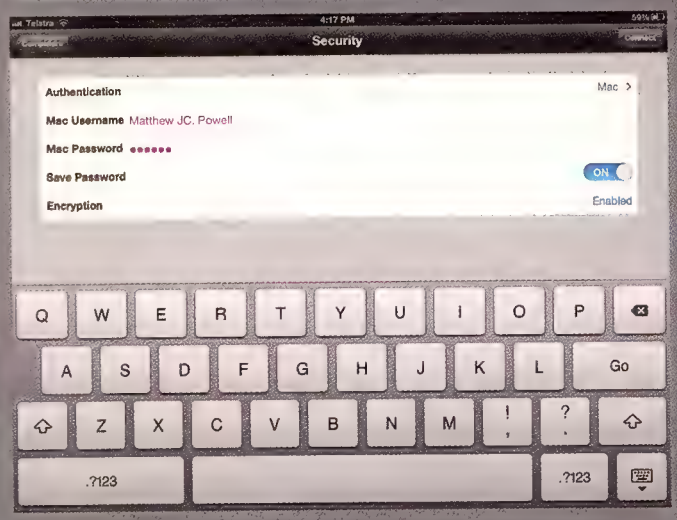


With 'Auto-Discovery' on, any computers you've set up with iTeleport Connect appear automatically in the list, saving you extra configuration.

When you start up iTeleport Connect, you can choose to find computers over the internet, on your local network or manually.


michael bublé
F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12
esc quit close switch alt tab ins del back home pg up select
tab undo cut copy paste enter ctrl alt del space ok
end pg dn

Tapping the 'Remote Control' icon gives you a range of extra function keys beyond what the iPad keyboard provides, including one-tap keys for cut, copy and paste – and Ctrl+Alt+Del.


Security
Authentication Mac
Mac Username Matthew JC. Powell
Mac Password
Save Password ON
Encryption Enabled
Q W E R T Y U I O P
A S D F G H J K L Go
Z X C V B N M
.?123 .?123

You can have iTeleport remember your computer's password or you can enter it each time for added security. You can also disable the encryption, though why you would is beyond us.

iTeleport Connect (**www.iteleportmobile.com/start**) on the computer you wish to control. All iTeleport Connect does is act as the 'glue' between the computer inside your home or office network and your iPad outside on the internet. Without it, you would need a fixed IP address (even if you have an 'always on' connection through cable or ADSL, your ISP may periodically change the address with which you connect to the internet – it's a way to make people pay for fixed IPs) and some knowledge of port forwarding on your modem and/or router. Trust us, iTeleport Connect is easier.

When you install iTeleport Connect on your computer, you'll be asked for a Gmail address and password. Don't worry, your network traffic is not in any way being routed through Google. This is just the login method iTeleport uses to match your fixed and remote machines. We use a dedicated Gmail address for this just in case our 'real' Gmail addresses are ever compromised – there's no point giving someone a key to your computer.

The iTeleport installer for either Mac or Windows will activate screen sharing using whichever method you prefer. On the Mac, you can open the 'Sharing' pane of 'System Preferences' and configure this yourself or let iTeleport do it for you.

Once that's done, install and open iTeleport Connect on your iPad. You'll see four icons along the bottom: 'Internet', 'Discovered', 'Manual' and 'Help'.

- Tap the 'Internet' icon and you'll be given the option to enter the Gmail login details you entered into iTeleport Connect. Tap 'Sign In' and it should automatically discover any computers that are logged into iTeleport Connect with those credentials (there's no limit to the number of computers you can connect to). Tap the name of the computer, then the 'Connect' button (top-right corner) and your screen should appear. You may or may not need to sign in again.
- Tap the 'Discovered' icon and you'll see only computers that are on your local Wi-Fi network. You don't need iTeleport Connect for this, but 'Screen Sharing' has to be activated. This is very handy for using your iPad to control a Mac when giving a presentation, for instance.
- Tap the 'Manual' icon to configure access to a computer without iTeleport Connect. Some networking knowledge is required for this. This is what you'll have to use if you're using Linux or anything else other than MAC OS X or Windows.
- Tap the 'Help' button for help with setting up or using iTeleport. Some settings are also configured from the 'Help' menu, oddly enough.

In the 'Internet', 'Discovered' or 'Manual' tabs, where you see the list of computers you can connect to, there's a blue arrow next to each. Tap on that to configure additional security and connection options. For example, you can set the number of colours to use – your Mac may display millions of colours beautifully, but that's going to be a strain on a 3G connection. Set that to 'Hundreds' for a speedier experience. You can also set the refresh rate manually or allow iTeleport to decide, based on the connection speed.

Whichever connection method you're using, tap the computer name followed by the 'Connect' button to log in. Once you've logged in to your computer, you'll see your screen exactly as if it were in front of you. If you have multiple displays, you'll see them all together as if they were one. Pinch and zoom to get a closer look at the display you want to use.

To move your mouse around the screen, simply swipe with your finger. The iPad screen acts like a trackpad, so the gesture is what's important,

OTHER CONTROL APPS

iTeleport is our remote control app of choice, but it's far from the only one. Some others worth considering are:

LOGMEIN

There are two versions of LogMeIn: the free LogMeIn app that gives you functionality similar to that of iTeleport, with access to 'pro' features on a subscription basis; and LogMeIn Ignition, which costs $139.99 and provides the pro features without needing a subscription. One trick that the free LogMeIn provides that iTeleport doesn't is direct file transfer from remote computers within the app. Among the various pro features that cost extra are sound streaming (Windows only at this stage) and printing to AirPrint printers from within LogMeIn.

SPLASHTOP 2 REMOTE DESKTOP

Splashtop uses a streamer app on the host computer to aid screen sharing and uses its own protocol, neither RDP nor VNC. This also means you get sound, file transfer and other goodies. If you're just using it over Wi-Fi, you needn't pay any more than the $8.49 purchase price, but if you want to use it over the internet (ie. really remotely) you need to buy an Anywhere Access Pack for $1.99 a month or $16.99 a year.

MOCHA VNC

The least expensive remote control app you can get, with the most basic feature set. This is fine, if basic features are all you need. There's a free version to try before you buy, although the full version is a mere $6.49.

not the position of your finger. iTeleport does offer a touchscreen mode if you want to see what it's like to control your Mac as if it were a touchscreen device, but we'll spoil the ending for you: it sucks. An interface designed for a mouse doesn't work well with touch. Just ask Microsoft.

Tapping on the screen simulates a mouse click, double-tapping simulates a double-click, tapping with two fingers simulates a right-click – much like Apple's own multi-touch trackpad gestures. In iTeleport's 'Help' section, tap on 'Controls' to see a full list of gestures the app supports.

If you want to type in, say, a text editor you've logged into on your computer, tap the keyboard icon in the top-right corner of the iTeleport app. You may notice that there's a single-line blank text entry field above the keyboard. Anything you type into that field appears simultaneously on the screen of your computer (at the point where you've placed the cursor) and in that field on the iPad.

If you're going to be doing a lot of typing, we recommend tapping the square icon to the right of that field, which opens it up into a larger field. This gives you more room to see what you're typing and also allows you to use the iPad's auto-correction and dictation tools. When you've finished typing, tap 'Send' and whatever you typed (or dictated) will appear on your host computer at the cursor.

Of course, the iPad keyboard lacks the modifier keys that both Mac and Windows users rely on, such as Ctrl, Shift, Alt/Option and Command/Windows. If you tap the small icon second from the left at the top of the iTeleport screen, buttons for each of these keys will appear. You can tell iTeleport what type of computer you're connecting to, and it determines which set of modifier keys will appear on screen.

There's no need to hold the modifier buttons as you would the keys on a real keyboard – just tap once to modify your next key press (Command+A, for example). If you want the modifier to persist, tap twice and the button will turn blue. The modifier is active until you tap it again.

You needn't necessarily use the modifiers, though, as iTeleport also includes a handy screen of function buttons. The small icon between the modifiers and the keyboard is the 'Remote', and tapping it gives you a range of commands like cut, copy and paste, plus arrow keys, F1-F12 and media control keys.

Incidentally, iTeleport does support the use of Bluetooth keyboards connected to your iPad. If you have such a keyboard, you'll still have to tap the keyboard icon in iTeleport to let it know you want to type, but the onscreen keyboard won't appear.

So, what is it good for? Remote control is more useful than just emailing yourself a document you've left behind. For example, you can use desktop applications with far more power and functionality than is available to iPad apps – Adobe Photoshop, for instance, or Microsoft Office, complete with macro support. Even if the rumours are true and Microsoft releases Office for iPad, it won't support macros.

There are also a great many web sites that require Flash or other plug-ins which aren't – and won't ever be – supported on the iPad. Again, firing up a full desktop web browser is only as far away as iTeleport, or an app like it.

You can also use it to keep a discreet eye on what the kids are doing on the computer, if you can't be in the room with them. And of course, if you discover they're doing something they oughtn't, you can not-so-discreetly stop them without having to move from wherever you are.

We find it's a godsend in our role as de facto tech support for our family members. We can fix most problems on somone's computer from wherever we happen to be, saving us a trip to their place, except when there's a hardware fault or a network issue that stops us from connecting. The money we've saved in petrol alone has paid for iTeleport many times over.

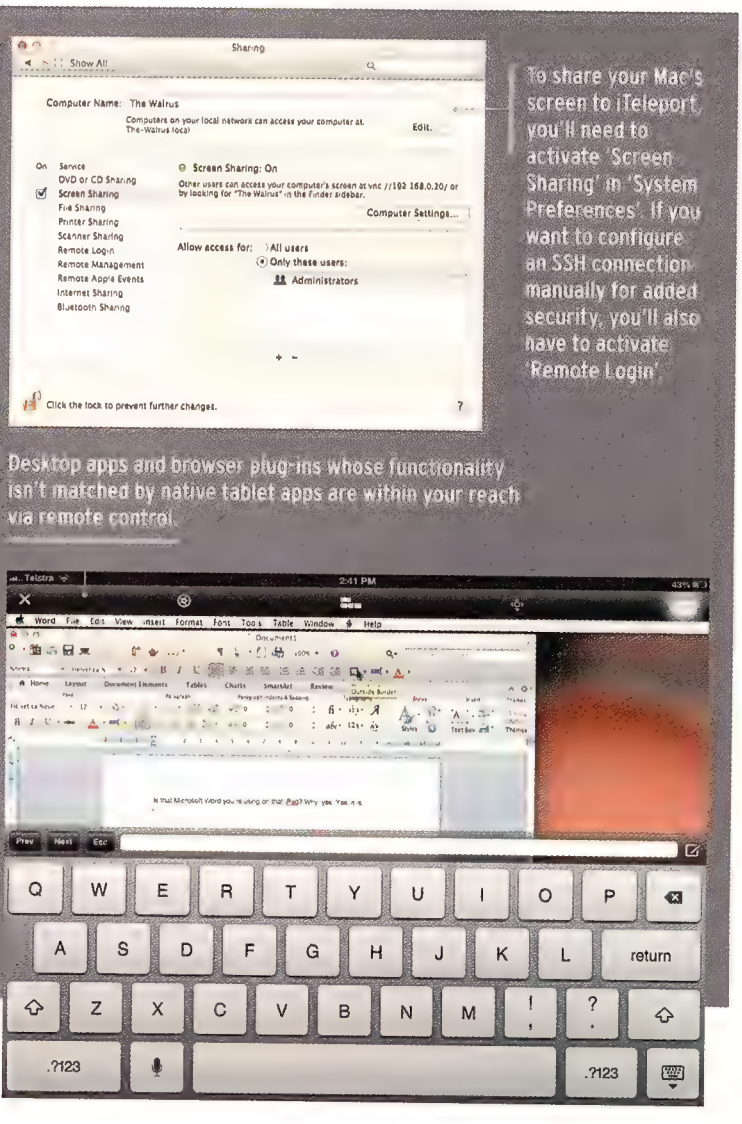
HOW SECURE IS THIS?

If you're using iTeleport Connect, the connection between your iPad and your computer is encrypted end to end, so you needn't worry about data being intercepted. If you don't trust iTeleport's encryption (or if you're using Linux and can't use iTeleport Connect), you can set up an SSH login yourself with the 'Manual' option.

To do this on a Mac, you'll need to activate the 'Remote Login' option in the 'Sharing' pane of 'System Preferences', which turns on the Mac's SSH server. On the iPad, tap the blue arrow icon next to the host name and then tap on 'Encryption' and enable it. Enter your Mac username and password.

The difference in doing it this way is that you have a secure SSH connection to your computer. Traffic between the SSH server and the VNC server is unencrypted – that's not a problem if the SSH server (the 'Remote Login' option) and the VNC server (the 'Screen Sharing' option) are on the same computer. However, if you want to log into an SSH connection on a server in the office and from there run VNCs to other computers on your network, there's more configuration to be done to make it secure. Unfortunately, that's somewhat beyond the scope of this tutorial.

For the vast majority of users, that level of complexity is totally unnecessary as iTeleport's encrypted VNC tunnel is more than adequate.


Sharing
Show All
Computer Name: The Walrus
Edit...
Screen Sharing: On
Computer Settings...
Allow access for:
All users
Only these users:
Administrators
Click the lock to prevent further changes.
To share your Mac's screen to iTeleport, you'll need to activate 'Screen Sharing' in 'System Preferences'. If you want to configure an SSH connection manually for added security, you'll also have to activate 'Remote Login'.
Desktop apps and browser plug-ins whose functionality isn't matched by native tablet apps are within your reach via remote control.

TECHlife AUSTRALIA

TECHlife
ISSUE 12 JUNE 2013
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USB audio on Android

USB audio devices can significantly improve the quality of audio recording and playback. Simon Chester explains how.

YOU'LL NEED THIS

USB OTG CABLE

You'll need this cable to connect your USB device to your handset or tablet.

USB AUDIO RECORDER PRO

This $4.46 app communicates with connected USB devices.

USB MIC OR DAC

These devices can extend the audio capabilities of your Android phone or tablet.

Since Google blessed Android 3.x with the ability to work in USB host mode, it has become possible to attach an array of transformational USB devices to your handset, giving it new abilities and uses.

Being a bit of a music nerd, the USB devices that get me the most excited are external audio devices. These devices can either give you a method to record high-quality sounds or listen to music at a higher fidelity than is possible from the standard headphone jack.

However, native support for USB devices in Android is still inconsistent between manufacturers and devices, and even if your device supports USB host mode, it doesn't mean that it also supports USB audio devices. For instance, the Galaxy S III supports USB audio out of the box, but the S II – running the same version of Android – doesn't. Likewise, the Nexus 7 and 10 can work, but the Nexus 4 can't.

If your phone doesn't natively support USB host mode and/or USB audio devices, all hope is not lost. Often, there are custom kernels available that include the functionality – the Siyah Kernel for the Galaxy S II is a notable one that (experimentally) supports USB audio. Note that flashing a custom kernel does require a rooted Android device, so this isn't for everyone.

Because of this limited compatibility, we would recommend that you read up on compatibility before purchasing a USB device. If you already have one, follow on to see how you can get it to work.

PART 1: RECORD PRO-GRADE AUDIO WITH A USB MIC

Recording through a USB audio device (usually, a USB mic) requires a USB On-The-Go (OTG) cable (available on eBay for a few dollars), which converts your micro-USB port into a full-sized, host-capable USB port. You'll also need the USB Audio Recorder PRO app ($4.46) by eXtream Software Development, available from Google Play (not to be confused with USB Audio Recorder or USB Audio Field Recorder, which are both from different developers).

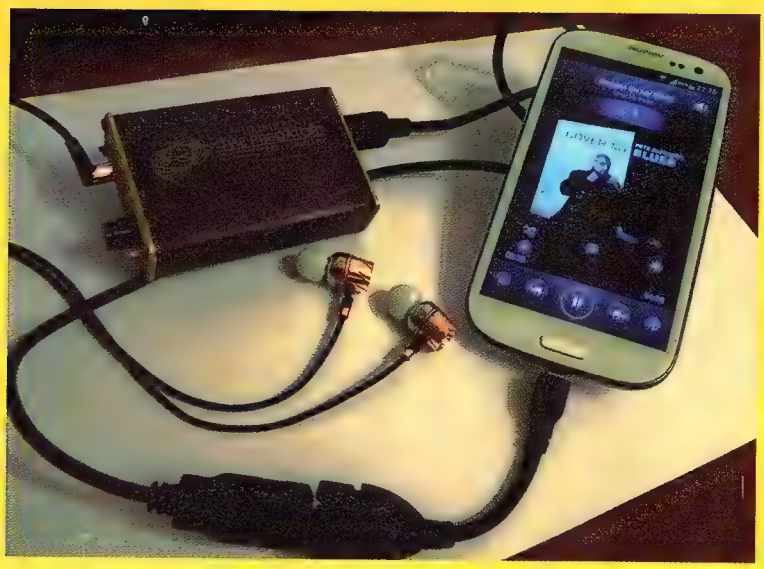
This app actually contains custom USB audio code written by the developer, which enables it to communicate with USB audio devices without relying on kernel support. This means you don't have to root your phone to get it to work. No other developers have done this, but there's talk of the developer making the code available to other apps – hopefully some good playback apps, such as Poweramp, Neutron Music Player or PlayerPro.

There are still some software requirements outside of the app's control, however, so it won't work with every USB host-capable device. A list of out-of-the-box compatible USB and Android devices is available at **www.extreamsd.com/USBAudioRecorderPRO**.

First download the trial version of USB Audio Recorder PRO (the link is available on the app's Google Play page), to see if it works with your phone and USB device. Before you open the app, you'll need to plug in your USB device so that it's correctly identified at startup. You can select the quality of your recording by using the combo buttons on the right side of the screen, and the recording directory by visiting the 'Preferences' tab at the top of the screen. Recording is just a matter of hitting the 'Record' button.

If your device isn't working, you can enable a workaround for some non-compatible, rooted devices in the 'Preferences' menu. Again, it won't work for everything.

When recording, it's recommended that you enable 'Airplane' mode, shut down all background apps and keep USB Audio Recorder PRO in focus (ie. don't switch to other



The Samsung Galaxy S III supports many external DACs. Photo courtesy of **HeadFi.org** forums user *PeterPenHK*.

Another Galaxy S III-compatible DAC and headphone amp combo. Photo courtesy of **HeadFi.org** forums user *NZtechfreak*.

apps). If you receive a 'Failed to start recording' error, it could be that your USB device is drawing too much power. You can solve this by inserting a powered USB hub between the phone and your device, but this obviously isn't ideal for mobile applications.

PART 2: IMPROVE AUDIO OUTPUT QUALITY WITH A USB DAC

Having USB audio support on Android also allows audio to be routed through high-quality playback devices, such as USB DACs or USB DAC and headphone amp combos. What's a DAC, you ask? A digital-to-analogue converter does what the name implies – it converts digital sound data into audio. They're present in every device that plays digital music, from CD players to mobile phones, but more often than not, they're of 'good enough' quality, rather than 'good' quality.

A good DAC can transform a cheap device into something stunning and in the case of portable equipment, when you then pair this clean signal with a good set of headphones and a headphone amp to drive them, your mind will be blown (well, mine was).

In addition to recording, the aforementioned USB Audio Recorder PRO app can also handle the playback of WAV, FLAC and OGG files (not MP3, though, as it's patented), via your USB DAC (connected with a USB OTG cable); however, being primarily a recording app, it has a very basic playback interface. This still remains a workable option if you don't really use MP3s, your phone doesn't natively support USB audio and you don't want to fuss around with new kernels. You can load playlists created in other apps from the 'Playlist' tab or single files from the main screen (just tap the little folder icon).

You'd probably prefer to listen to music in your app of choice, though, which means you need kernel-level USB audio support. For a fairly comprehensive list of compatible Android devices and DACs, visit **tinyurl.com/cpx2uzo**. This list also states whether the device will work only in USB Audio Recorder PRO or in any app.

If you're device isn't on this list, things become very fiddly. You're going to have to visit **forum.xda-developers.com** and search in your device's sub-forum for a kernel that supports USB audio – a search for USB DAC kernel should do the trick.

When you've found a compatible kernel, flashing it should be a cinch for anyone who's previously rooted their handset, which you would have already done, as flashing a kernel requires a rooted device. Usually, all you need to do is boot into 'Recovery' and flash the downloaded ZIP file. Just remember to do an Android backup before you start (this is really important)!

If you've found a kernel that promises USB audio support, chances are you'll need to have your USB DAC plugged in when you boot up your phone, in order for it to be detected. If you unplug your DAC, you'll then have to reboot again when you plug it back in. Each kernel will be different and support is getting better, so this requirement may not be around for much longer (or by the time you read this).

The V-MODA Vamp Verza external DAC and headphone amp, complete with Galaxy S III case.

Full and functional USB audio support promises to bring audiophile-quality audio to the portable domain. In fact, the first DACs designed for use with Android are now starting to appear on the market – the beautiful V-MODA Vamp Verza is one example that even has a case which attaches to the Samsung Galaxy S III. Unfortunately, the lack of standards – as you just discovered – means high-quality audio recording and playback is still far from being painless.

In time this will improve, however, and it won't be long until you can purchase just about any USB audio device and have it work with your smartphone. In the meantime, you can let Google know that you want USB audio support included in Android by starring the issue at **tinyurl.com/d97qssx**.

For less compatible devices, USB Audio Recorder PRO also allows playback.

A USB microphone with USB Audio Recorder PRO.

Start a Minecraft server

You can complete quests faster if you can take your friends along with you. Alan Smithee shows you how.

YOU'LL NEED THIS

A MINECRAFT ACCOUNT

This isn't going to work if you haven't purchased *Minecraft*. Get it at **www.mojang.com**.

A SPARE PC

It's best to run the server on a machine you're not going to want to run the client on at the same time.

Minecraft is two games in one. There's the solitary survival game, where you plunge into a digital wilderness like a cuboid Bear Grylls and punch trees, and there's the multiplayer game, where you compete to build the largest pixel-penis and nudge your chums into lava for a giggle. If you've only played the former, you owe it to yourself to experience the latter. It's *Minecraft* on a completely different level.

Imagine collaborating on builds with someone else on a Creative server; it'll take half the time to create Mount Phallus than it might have done alone, or even less if you get more hands involved. A multiplayer survival server can be great fun – the quest to defeat the Ender Dragon is much less of a slog if you're all turning up pearls – and one with PvP enabled is even better. Here's how to get started.

01 SET UP THE SERVER

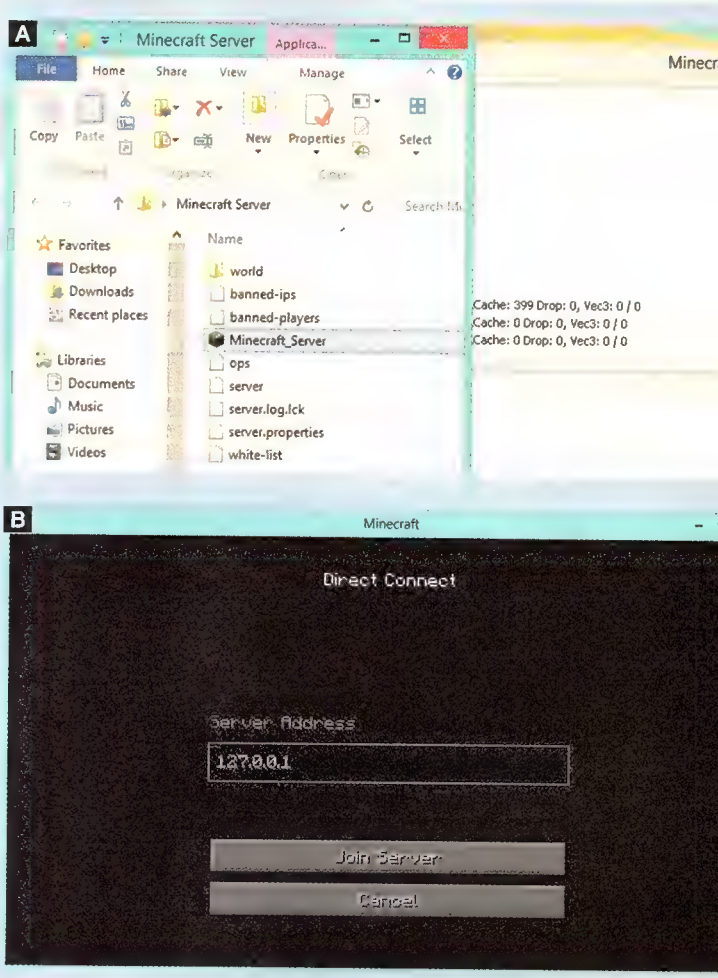
Before we wade in, we'll presume you've run *Minecraft* before. This means you'll have the latest version of Java installed – preferably the 64-bit version, if you're running a 64-bit system. This should be Java version 1.7 or higher. You can find out which version you're running by opening a command prompt window (Windows key+R), typing `cmd`, hitting Enter and typing `java –version`. If an error is thrown up or an older version number is displayed, head over to Oracle's Java download page (**www.java.com/en/download**) and snag the latest update. Bear in mind while you're installing it that it will suggest you might want to install the Ask toolbar. You don't want to do that, so uncheck the appropriate box.

If you're still having trouble identifying your Java version, you may need to set a system path to the Java installation folder. Right-click 'Computer', choose 'Properties > Advanced' and then click 'Environment Variables'. Append C:\Program Files\Java\jre7\bin to the end of the 'Path' list to ensure you can access Java from anywhere on your PC.

Minecraft's server software runs in Java, just the same as its client. It had better, given the amount of time we just spent making sure Java was running properly. Unlike the client, though, there's no pretty cuboid interface to play with. You'll have to make changes in a text file and if you want to play on a locally hosted server, you'll need to run the client separately. As you'll see, though, hosting your own *Minecraft* server isn't nearly as tricky as it might seem at first.

It's actually really easy to start a *Minecraft* server on your local network. You'll want to start by grabbing the server-specific packages from publisher Mojang. Just head to **www.minecraft.net/download** and get the simple 'Minecraft_Server.exe' file. Once it's downloaded, give it its own folder somewhere you can find it.

Right-click the executable and run it as an Administrator. You'll soon see the reason we give it its own folder: running it the first time generates a whole heap of additional configuration files and level data (image **A**), which we'll want to keep neat and tucked out of the way. It'll create a new world with a random seed and just like that, you've got a server going.



To prove to yourself that it's working, fire up the *Minecraft* client. You'll need to have actually bought the game to do this. Choose the 'Multiplayer' option, then 'Direct Connect' and use the address 127.0.0.1 (image **B**), which is the universal IP for 'this machine'. Local machines on your network should be able to connect using your computer's IP.

02 OPEN UP TO THE WEB

Running a server on your local network is one thing; opening up that server to the internet is quite another. For starters, the terms of your broadband contract may preclude you from running any kind of gaming server from your home.

We can't really help you there – apart from suggesting a third-party server solution – but if you're OK to do it, you'll need to configure your router to forward your ports appropriately. Find out the local IP address of the machine on which you're running the *Minecraft* server

C
Minecraft
Unknown command. Try /help for a list of commands
Your game mode has been updated
Usage: /give <player> <item> [amount] [data]
Your game mode has been updated
/gamemode 1

(and make it static, if you can), and make sure all connections to your router on port 25565 go straight to your server machine. Use **www.portforward.com** to find the specific instructions for your particular router.

Before you allow anyone to connect to your router directly, we'd recommend obfuscating your external IP address. Port Forward shows your external IP on its front page; copy this down and head to **www.no-ip.org** to sign up for a free IP forwarding address. Send this to your online friends and they'll be able to connect to your PC with no knowledge of your IP.

03 MASTER YOUR DOMAIN

Being the owner of a *Minecraft* server means one thing first and foremost: giving yourself godly abilities beyond the reach of mere mortals. Shut down your server and then open the file in its directory called 'ops.txt'. Stick your username in here, save it and then run the server again. Test it out by changing your game mode – hit / and type `gamemode 1` (image **C**), and you should enter 'creative' mode.

One of the most useful commands as an op is `give`. You can use it for a sneaky cheat or to give items that can't be legitimately obtained by other means. There's a list of item values on the *Minecraft* wiki (**minecraftwiki.net/wiki/Data_values**). Try it: give yourself one monster spawner with `/give <nickname> 52 1` or a stack of diamonds (always pretty useful) with `/give <nickname> 264 64`.

Wouldn't it be great to have control over the sun and the moon? Perhaps the winter wouldn't be quite so harsh if we could just type `/time set day` to make it immediately sunrise, `/time set night` to make it sunset, or use any value between `0` and `25,000` to set the time more specifically (image **D**). It affects everyone connected to your server, so use it lightly – people will know you're messing around with the server!

Chances are you're running a private server for your friends rather than a public one. Use `/whitelist on` to set up whitelisting, where only people with approved usernames (and those in the ops file) are allowed to connect (image **E**). Then type `/whitelist add <nickname>` to insert a friend's name on the list, `/whitelist remove <nickname>` to get rid of them and `/whitelist list` to, yes, list who's on the list.

If you're on the blacklist, you're not coming in. Use `/ban <nickname> [reason]` to add them (image **F**) or `/banip <ip address>` to ban a particular machine. If you're messing with a pal, `/kick <nickname> [reason]` boots them off of the server temporarily. To take someone off the blacklist, use `/pardon <nickname>`.

Online system backups

Mayank Sharma shows you how to easily store all your files online with minimum fuss.

YOU'LL NEED THIS

COMODO BACKUP

To grab a copy, visit **backup.comodo.com**.

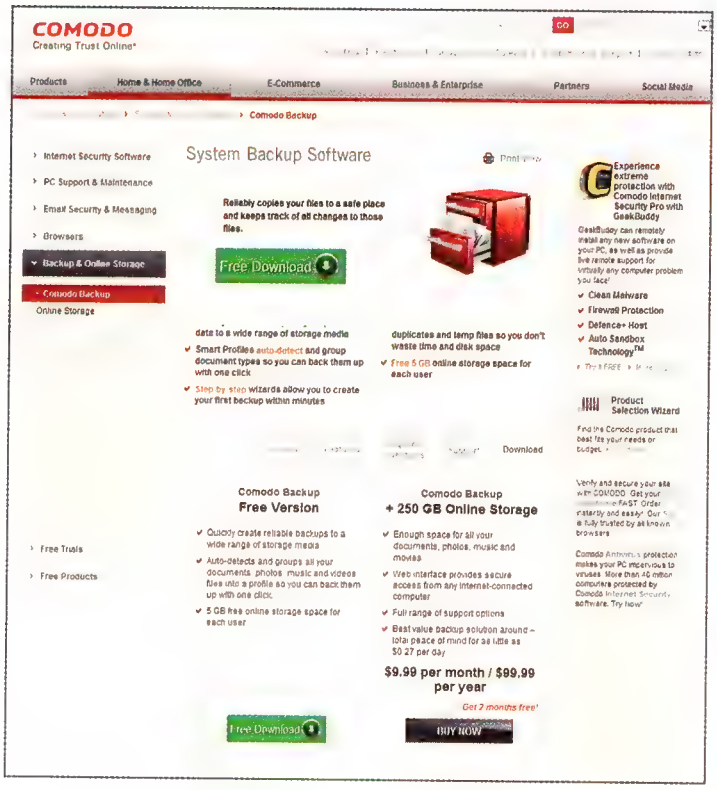
There's no shortage of backup tools available out there for free. What's different about Comodo Backup is that it's designed for the non-technical everyday PC user, so you can save your most important files to its online filing cabinet in one single, easy click.

That said, Comodo also offers lots of options for advanced users who want to customise their backups. For example, in addition to files and folders, you can also back up emails and even data from your web browser. While Comodo is designed primarily for backing up data online, you can also tweak the software to save your data to a local disk or a removable USB drive, if you so wish.

Best of all, when you download Comodo you also get 5GB of storage space just for registering. This is more than enough for most users and you can always buy more space should you run out at a later stage.

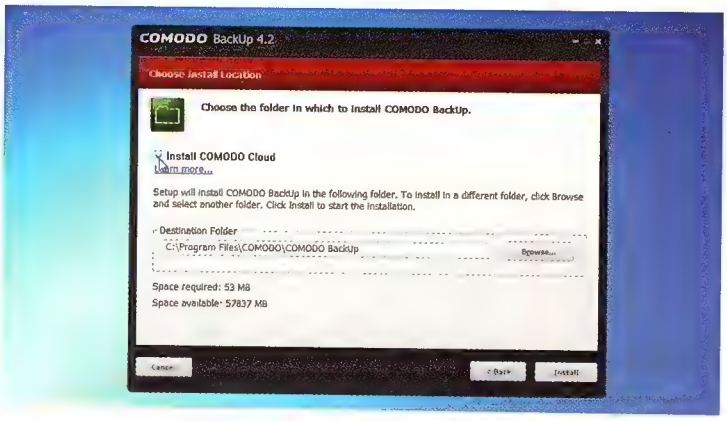
BACK UP YOUR COMPUTER

Preserve those important files and documents online with Comodo Backup.



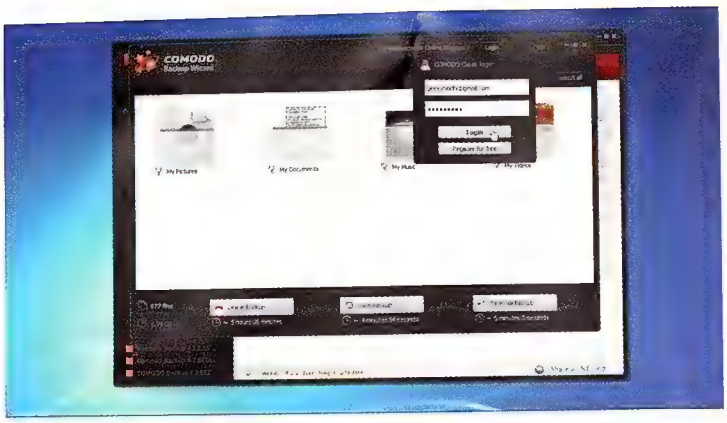
01 REGISTER & DOWNLOAD

Comodo's backup client is available to download from **backup.comodo.com**. Before you can download the free version, you'll need to register for an account by providing your email address and specifying a password. Of the two download options you get, make sure you download Comodo Backup, which is the most comprehensive.


COMODO BackUp 4.2
Choose Install Location
Choose the folder in which to install COMODO BackUp.
Install COMODO Cloud
Learn more...
Setup will install COMODO BackUp in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files\COMODO\COMODO BackUp
Browse...
Space required: 53 MB
Space available: 57837 MB
Cancel
< Back
Install

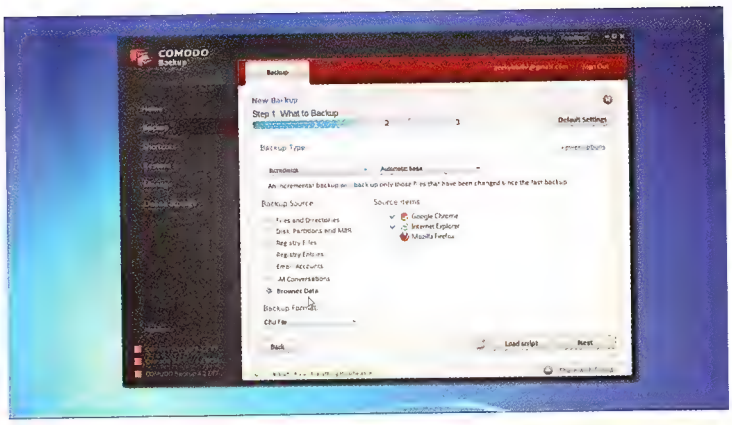
02 INSTALL THE CLOUD CLIENT

After downloading the client, double-click on its setup file to install it. During installation, you'll get the option to install Comodo Cloud. This is optional, but highly recommended. When you drag files in Windows Explorer, you'll get a small window into which you can drop your files, which will then be copied into your Comodo cloud storage.



03 CLICK TO BACK UP

When you launch the app, it'll scan all your drives. When it's done, Comodo will list all your files in four virtual folders. Select a folder to see how long it will take to back up. Before you back up to the cloud, sign in by clicking on the 'Login' button. Click the 'Online backup' button to begin.

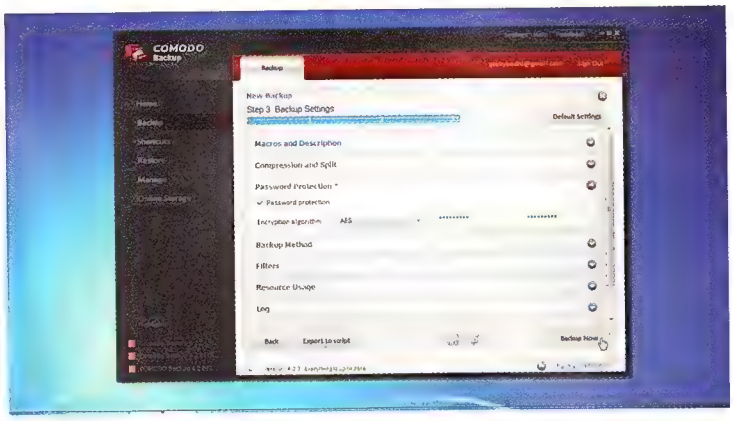


04 CUSTOMISE BACKUP

Switch to the 'Backup' tab on the main Comodo interface. Here you can select different sources, such as 'Email accounts' and 'Browser data'. You'll get additional options depending on the backup source. If you select 'Browser data', you'll be shown a list of browsers installed on your computer.

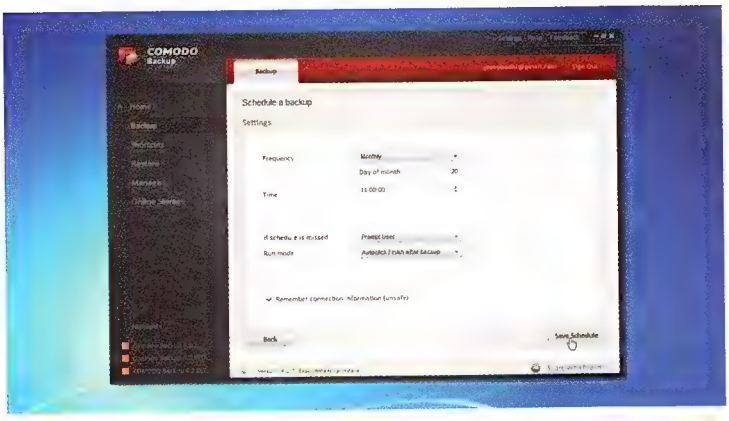
05 CHANGE DESTINATION

You then need to choose the destination where your backup will be stored. The default Comodo Cloud option will save files to your online storage account and will show you the list of files already saved and the available free space. If you don't want to customise this any further, hit the 'Back up now' button to begin the process.



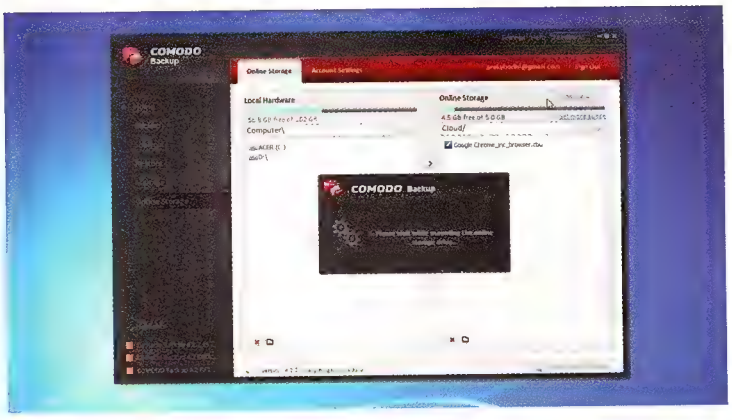
06 ADVANCED SETTINGS

To customise your backup, click the 'Next' button – you'll be shown a list of settings. If you want to protect your backups, click the 'Password protection' drop-down menu, where you can select an encryption method (such as AES) and a password. Another useful setting is 'Compression and split', which reduces the size of the files.



07 SAVE & SCHEDULE

If you'd like to run this backup process again, you can save yourself the trouble by saving a custom profile. Click on the floppy disk icon at the bottom of the interface and then enter a name for the custom backup profile. You can also schedule this backup to run automatically by clicking the alarm clock icon.



08 MOUNT CLOUD DRIVE

Comodo will then back up your data to the cloud, which you can browse by clicking the 'Online storage' tab. You can copy files directly between the local drive and the cloud storage using the arrow icons. If you hit the 'Mount' button, your online drive will appear as a regular drive in Windows Explorer.

DIY Nvidia Project Shield

Why wait for the new hand-held console to be released? Make your own Steam-streaming tablet with a little help from Neil Mohr.

YOU'LL NEED THIS

SPLASHTOP 2 OR THD

Available for iOS, Android and Tegra devices. It even supports the old HP TouchPad webOS devices, if you still have one knocking around.

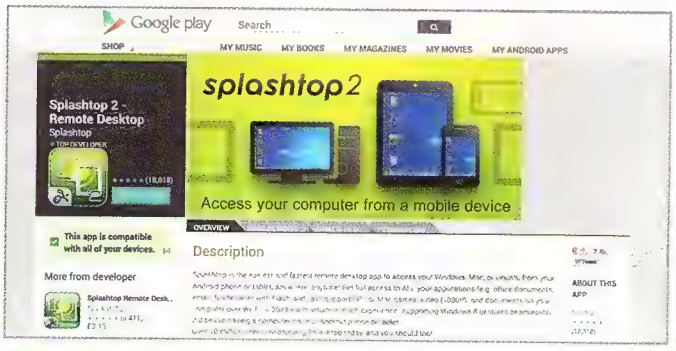
We've previously looked at how you can use Windows Remote Desktop Protocol (RDP) to connect to any Windows system remotely, using pretty much any device. However, while Windows RDP is fast in terms of Windows refresh, it's not optimised in any way for gaming or video. If you play a full-screen video you'll get a frame or two a second at best – nowhere near the 30fps you'd want for enjoyable viewing, and gaming is out of the question.

Once more, technology has come to the rescue. A long-standing app called Splashtop (**www.splashtop.com**), which is available for Android, Apple iOS and webOS mobile devices, enables remote high-speed, low-latency sharing on Windows, Mac or Linux desktops. The downside is that it achieves this through a more CPU-intensive high-quality encoding system than RDP. That said, the CPU overhead isn't too significant – around 9-15% for a second-gen Intel Core i5. If you're running something more sluggish like an AMD Athlon II 1.5GHz, it's more like 30%.

Splashtop is also different to Windows RDP in that it runs on top of the current logged in user account, whereas RDP requires a specific user account to log in. It might seem an odd differentiation to make, but it has security implications.

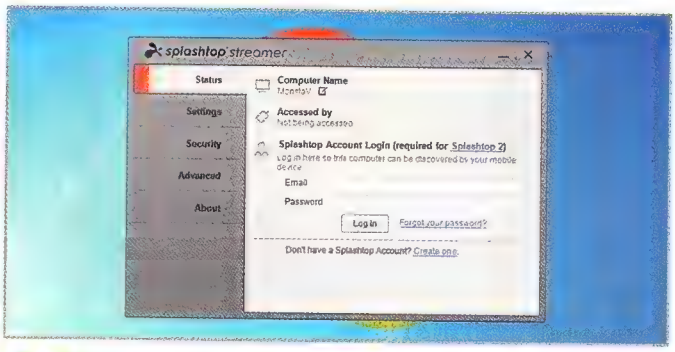
DIVING INTO SPLASHTOP

Take a tablet, a network and a PC, and get connected.



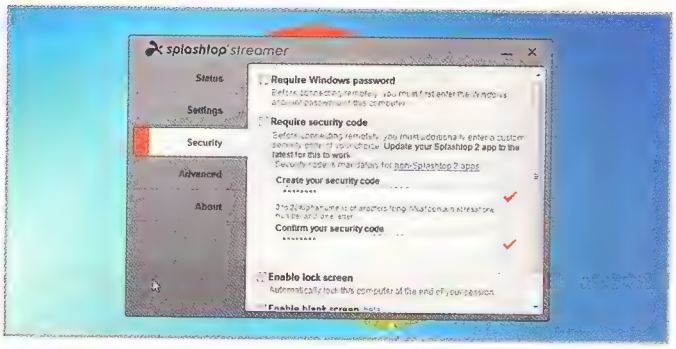
01 SPLASH ONE, TWO

Both the free Splashtop 2 and paid-for Splashtop THD apps are available on Google Play. Splashtop 2 is the latest and fastest version, but there's a fee for internet access and gaming. Splashtop THD is an Nvidia gaming version designed for Tegra devices, with preconfigured game controls and support for free internet access. We'll look at both.



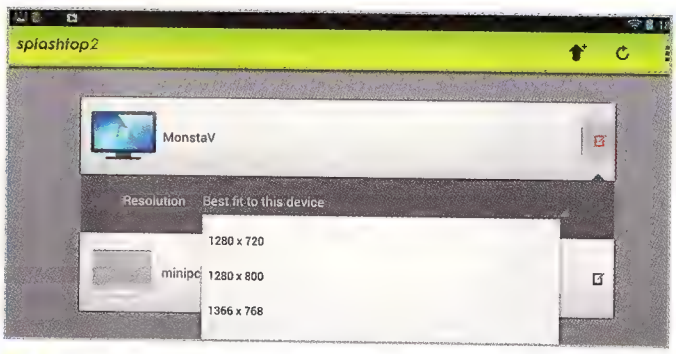
02 DESKTOP SPLASH

You'll also need to install the Splashtop desktop streamer on any system you want to access remotely. It's available from **www.splashtop.com** and it supports all versions of the mobile app. Splashtop 2 users will need to create an account for general use. This is also used for billing and remote logging access.



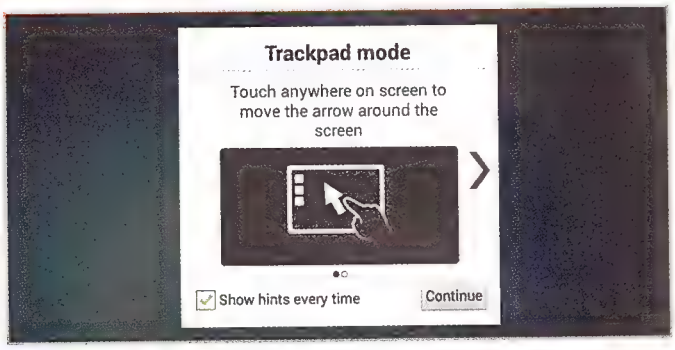
03 STAY SECURE

Splashtop's 'Desktop Security' tab offers a number of useful tools. The security code is aimed at older versions when connecting locally or remotely over the internet. You can force newer versions to use this, or to request your Windows account password. The 'Lock' and 'Blank' options are useful for securing the remote PC during use.



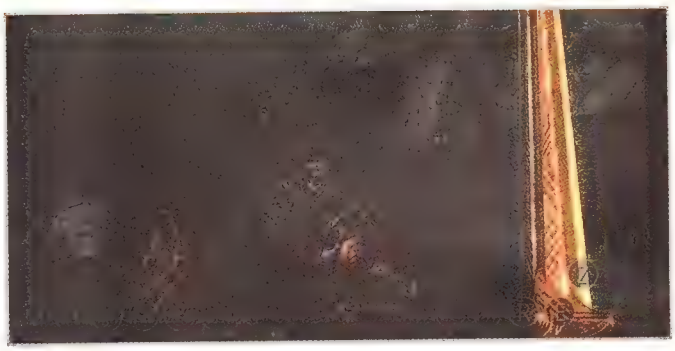
04 DESKTOP RESOLUTIONS

If Splashtop is running on your desktop, the app will display systems ready for connection. Desktops that are greyed out are ones you've used before, but are currently unavailable. Tap the far-right end of a desktop entry to see a list of resolutions. We recommend 'Best fit' or a device-native resolution such as 1,280 x 800 for the Google Nexus 7.



05 CONTROLS & GAMES

In direct-to-click mode, a single tap represents the left mouse button and a tap-hold represents the right. A two-finger tap switches between direct-to-click and trackpad mode, where dragging anywhere on screen moves the mouse while retaining an absolute position. For gaming controls, Splashtop 2 requires a subscription.



06 GAMING THD

For Nvidia Tegra devices, Splashtop THD comes with predefined controls for *Skyrim, Diablo III, Portal 2, World of Warcraft, Pro Evolution Soccer* and *Civilization V*. You can use these presets with other games, too. The main limitation is that games have to be played in window mode. It's best to put the taskbar into autohide and tweak the positioning of the game window.

07 BETTER GAMING

A three-finger tap opens the gaming controls. You can also tap the '+' button to move and adjust the default onscreen controls. The pad icon switches back to the standard trackpad control system. Wired and Bluetooth controllers are supported via Android ICS gamepad support, with a few key-binding adjustments on the PC end.

08 INTERNET, TOO

Since Splashtop 2 requires a subscription for internet access, you might want to buy Splashtop THD instead. The older versions use your Google account to link through to your desktop, while Splashtop 2 uses its own account system. If your router's UPnP isn't playing nicely, forward port 6783 to the system's IP address.

Investigate system hang-ups

Jon Thompson shows you how to use Process Explorer to see why your machine hangs.

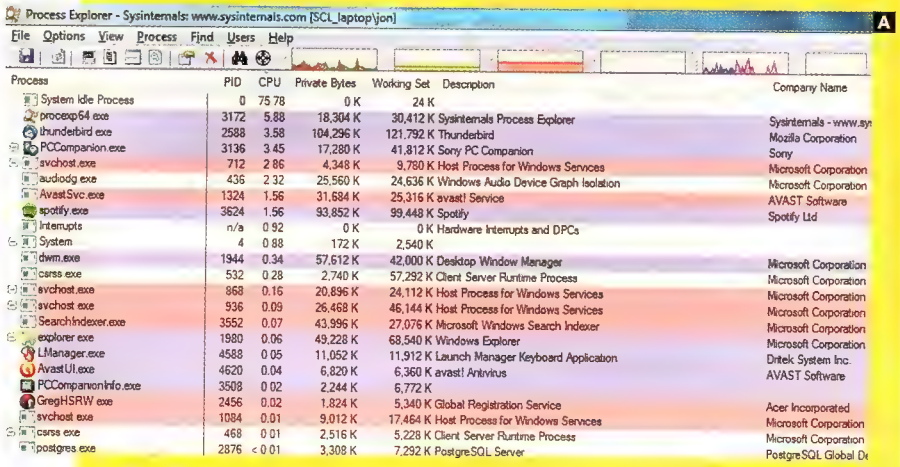
OU'LL NEED THIS

PROCESS EXPLORER

A more powerful alternative to the standard Task Manager, Process Explorer is available for free at **tinyurl.com/38bfsq.**

All my applications are closed, so why is my PC's fan suddenly blowing like an asthmatic elephant? Something is driving the processor hard, but what could it be? Have my antivirus defences been breached? How do I find out what's going on?

Deep at the heart of Windows lies the system scheduler. Easily the most complex and busy part of the OS, this code controls access to system resources. It's the best place to see what's happening and whether it's legitimate. For serious investigation, though, the built-in Task Manager isn't enough. We need something with more precision and scope.


Process Explorer - Sysinternals: www.sysinternals.com [SCI_laptop\jon]
File Options View Process Find Users Help
Process PID CPU Private Bytes Working Set Description Company Name
System Idle Process 0 75.78 0 K 24 K
procexp64.exe 3172 5.88 18,304 K 30,412 K Sysinternals Process Explorer Sysinternals - www.sy
thunderbird.exe 2588 3.58 104,296 K 121,792 K Thunderbird Mozilla Corporation
PCCompanion.exe 3136 3.45 17,280 K 41,812 K Sony PC Companion Sony
svchost.exe 712 2.86 4,348 K 9,780 K Host Process for Windows Services Microsoft Corporation
audiodg.exe 436 2.32 25,560 K 24,636 K Windows Audio Device Graph Isolation Microsoft Corporation
AvastSvc.exe 1324 1.56 31,684 K 25,316 K avast! Service AVAST Software
spotify.exe 3624 1.56 93,852 K 99,448 K Spotify Spotify Ltd
Interrupts n/a 0.92 0 K 0 K Hardware Interrupts and DPCs
System 4 0.88 172 K 2,540 K
dwm.exe 1944 0.34 57,612 K 42,000 K Desktop Window Manager Microsoft Corporation
csrss.exe 532 0.28 2,740 K 57,292 K Client Server Runtime Process Microsoft Corporation
svchost.exe 868 0.16 20,896 K 24,112 K Host Process for Windows Services Microsoft Corporation
svchost.exe 936 0.09 26,468 K 46,144 K Host Process for Windows Services Microsoft Corporation
SearchIndexer.exe 3552 0.07 43,996 K 27,076 K Microsoft Windows Search Indexer Microsoft Corporation
explorer.exe 1980 0.06 49,228 K 68,540 K Windows Explorer Microsoft Corporation
LManager.exe 4588 0.05 11,052 K 11,912 K Launch Manager Keyboard Application Dritek System Inc.
AvastUI.exe 4620 0.04 6,820 K 6,360 K avast! Antivirus AVAST Software
PCCompanionInfo.exe 3508 0.02 2,244 K 6,772 K
GregHSRW.exe 2456 0.02 1,824 K 5,340 K Global Registration Service Acer Incorporated
svchost.exe 1084 0.01 9,012 K 17,464 K Host Process for Windows Services Microsoft Corporation
csrss.exe 468 0.01 2,516 K 5,228 K Client Server Runtime Process Microsoft Corporation
postgres.exe 2876 < 0.01 3,308 K 7,292 K PostgreSQL Server PostgreSQL Global D
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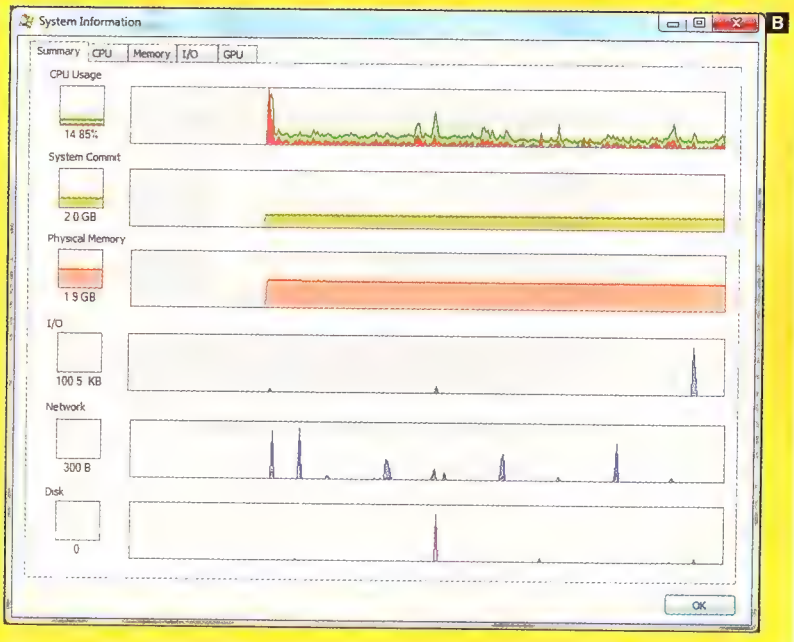


We need the free Process Explorer tool by Mark Russinovich. This Microsoft-supported standalone program is exactly what we want to delve safely into the heart of the OS.

1 GET STARTED

The first step is to get Process Explorer, which you can find at **tinyurl.com/38bfsq**. It doesn't need installing, so once you've downloaded it, you can easily carry it with you on a USB stick to diagnose problems on other people's PCs. Click 'Download' and a ZIP file will open. Create a folder somewhere convenient and drag the 'rocexp.exe' file into it.

To get a good look at the system scheduler, we need to run Process Explorer with Administrator rights. To do so, right-click the 'procexp.exe' file and select 'Run as Administrator'. A security pop-up will appear, asking you to confirm your decision. Click 'Yes' and the main Process Explorer interface will appear (image **A**). Maximise the window to see the most system information.

Click 'View > System Information' and a window will pop up, showing current resource use (image **B**). There are several tabs which give overviews of different parts of the OS and its processing hardware. On multicore systems, you should see multiple traces: one for each core.

2 INVESTIGATE PROCESSES

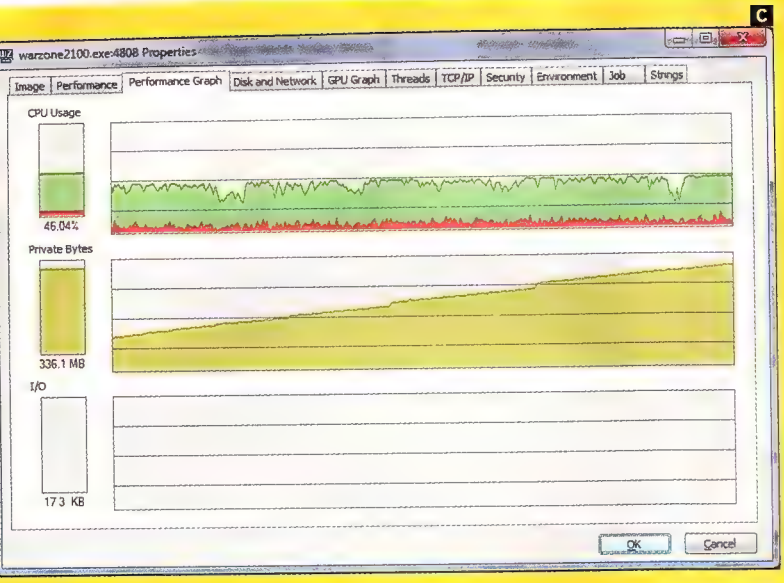
If CPU use seems high, Process Explorer can tell you which application is hogging it. On the main screen, click 'CPU' and the display will sort itself by the amount of CPU time taken. Processes should pop to the top of the list for a few seconds each. If a process stays at the top, this indicates high CPU use.

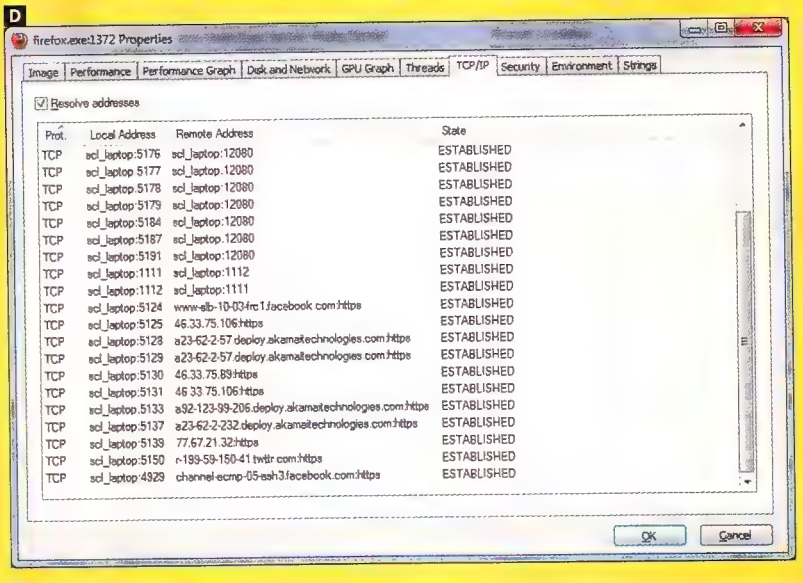
Click the 'Process' heading to see which processes are running. Scroll to the bottom of the display to see those started under Explorer, highlighted in pale blue. These are the applications you're currently using and the background processes that are started when you log in.

Right-click a running process and select 'Properties'. This brings up a window containing a detailed view of the process, split into several tabs. The performance graph (image **C**) is great for telling you if the process is using too many resources and whether that use is increasing. Steadily mounting memory use might be a sign of memory leakage (taking memory, but not giving it back when finished with it).

Process Explorer has a handy way of identifying a running process. First, bring the application in question to the front of your desktop. Next, in Process Explorer, drag the target icon at the top of the interface onto the application in question. This temporarily minimises Process Explorer and displays the application you selected. Drop the icon over the application and its process will be selected in Process Explorer.

When a new process begins, it can be hard to spot it in Process Explorer's list. To make new processes easier to find, click 'View > Scroll to New Processes'. When a new process begins, the display will then scroll to it and highlight it for you in green. Uncheck the option to switch off this feature when you want a more stable display.

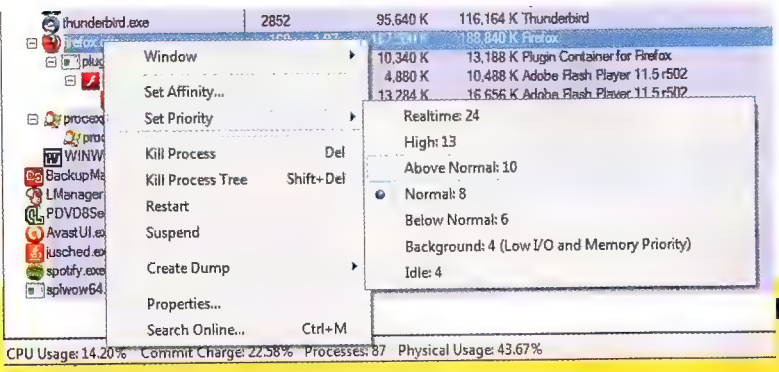




Some malware connects to the outside world and we can find out which web sites it's linking to. Right-click a process and select 'Properties'. On the resulting window, click the 'TCP/IP' tab (image **D**). Ensure that the 'Resolve addresses' button is ticked and expand the headings to see the web sites being connected to. Do they look dodgy? If so, it could be time for a full system scan.

3 TWEAK, KILL & RESTART PROCESSES

If you have a game or another demanding application running, you can boost its priority in the system scheduler. To do so, right-click its process and select 'Set Priority' (image **E**). Applications are normally set to 'Normal', but increasing this to 'Above Normal' will increase its availability to the CPU. Don't be tempted to set priority to 'Realtime' or you may lock up the system!



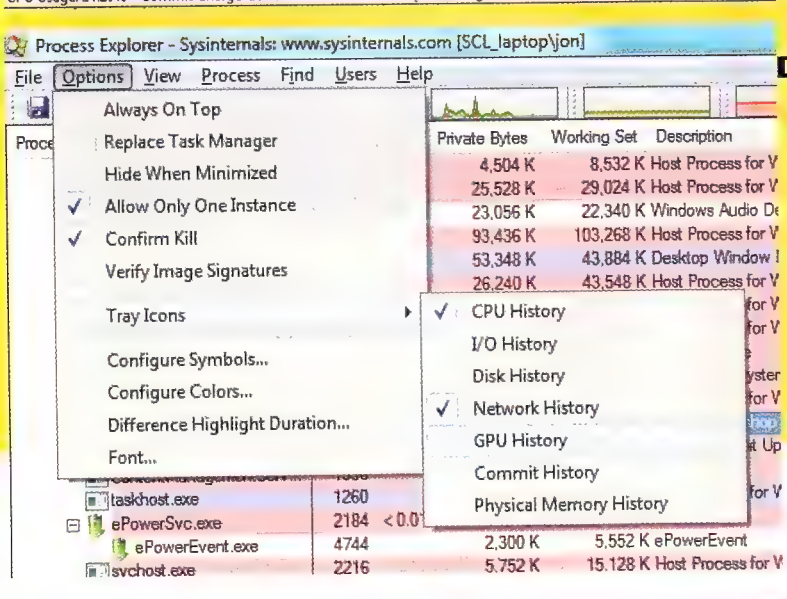
There's nothing worse in Windows 7 than a process that suddenly ghosts out and the dreaded words 'Not responding' appear in its window title. Instead of simply killing it or waiting for it to die, you can try restarting the process. To do so, find it in Process Explorer, right-click it and select 'Restart'. This will tell the scheduler to free the process's resources and start again.

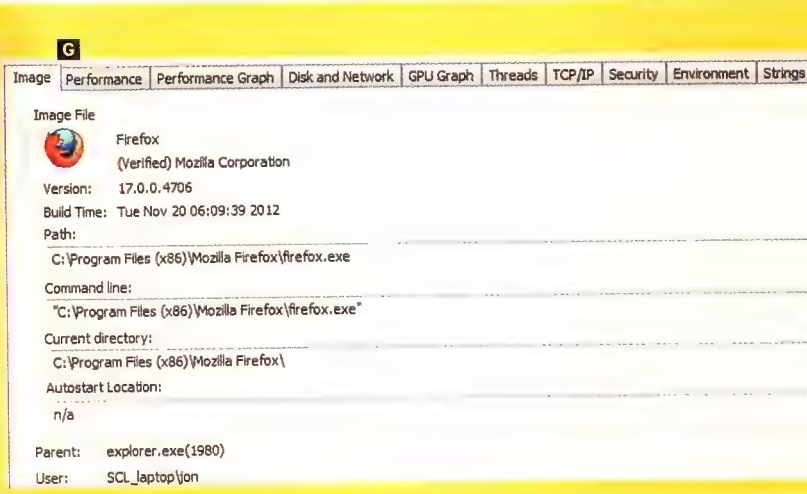
On a multicore system, a process that uses 100% CPU will usually do so using only one core. The others are free to run Process Explorer, so you can still kill the offending code and free up the system to reboot it properly. Right-click the process and select 'Kill Process'. Confirm that you want to kill it and the process will end.

4 EXPLORE OTHER FEATURES

When Process Explorer is running, you'll see a small graph of CPU use in the system tray. You can add other graphs here for handy reference by clicking 'Options > Tray Icons' and selecting what you need (image **F**). Note that these only appear when Process Explorer is running. If you hover the mouse over a graph, you'll be presented with more details.

Having delved into your running OS, it's very useful to make sure that nothing has tampered with an application's code. To do so, right-click the application and select 'Properties'. In the 'Image' tab (image **G**), click the 'Verify' button. If the producer is available, this will compare the EXE file with a check code and the word 'Verified' will appear next to the vendor's name.





Streamingly good gaming

Broadcast your gaming sessions live to the world.

YOU'LL NEED THIS

DESKTOP PC

Gaming and encoding are two of the more CPU-intensive things you can ever do, so a fast PC is recommended, with second-gen Intel Core or AMD quad-core processor or better.

OBS

Open Broadcaster Software (**obsproject.com**) is all you'll need, but perhaps a game or two as well. OBS is free and open source, so you can't get better than that.

Everyone wants to be noticed and showing off your gaming prowess to all and sundry is just one way of doing that. But isn't that going to be hideously complicated? Taking a look at the steps you need to accomplish can indeed be frightening: capturing, encoding, syncing, streaming and broadcasting live gameplay over the internet. All of that does indeed sound like it requires ninja-level technical skills.

We're here to kickstart that idea, though. With one software install and a suitable online account, you can stream your gaming antics to a waiting world in glorious Full HD.

It's a testament to how much power lies around unused inside even a modest modern PC – they're able to not only play cutting-edge 3D games, but also capture and encode live high-definition video, and then stream it to a remote server. The magic happens in two main chunks: the capture and encoding software, along with the streaming and broadcasting side of things.

We're going to walk you through setting up the software, optimising settings for your system and getting more from the plug-in system. However, before all of that, it's worth covering how the broadcasting side works.

Anyone aware of how much bandwidth an HD stream can consume will probably be wondering how we're expecting a home broadband connection to handle broadcasting an HD gaming stream to the world. The answer is we're not – we'll be using a third-party broadcast service for that. The good news is that the Open Broadcast Software (**obsproject.com**) we've chosen can work with all the main internet broadcasting systems and more besides.

BROADCAST THIS

Starting at the end of the process, the streaming service you choose does all the heavy lifting of broadcasting your live stream. So if one or one million people want to watch what you're doing, that's not your problem. As long as you have enough bandwidth to fire out a high enough bit rate stream of your gaming session, you're golden.

For our tutorial we'll be sticking with **www.twitch.tv**, just one of the many dedicated free broadcast services out there. You'll need to sign up for a free account, but that's nothing more than the usual email and password process. A key element for Twitch is that you can tag your video with the correct game, so anyone searching for feeds or footage of that game will stumble across yours as well. Additional services that are directly supported include **www.livestream.com**, **www.ustream.tv** and **www.hashd.tv**.

MASTER THE STREAMS

That's the wider broadcast aspect taken care of, but what if you're at the end of this streaming shower? It still requires you to have a reasonable broadband upload speed, but just how fast? As always, when offering advice your experience will vary depending on your actual equipment, broadband provider, background tasks and other users. A rough rule of thumb is for a decent-quality 1,280 x 720 stream you'll need an upstream speed of 1,000Kbps a.k.a. 1Mbps. Any less than this and you're better off sticking to 480p or a resolution of 854 x 480 or 800 x 600, at a 4:3 ratio.

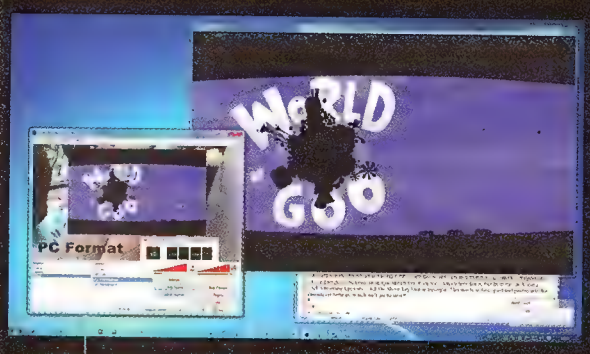
If you're thinking about 1080p resolutions then you need a pretty fast upstream connection. Even conventional wisdom suggests a double rate of 2,000Kbps, but OBS recommends at least 2,500Kbps. We'd expect that people with the fastest ADSL2+ connections could stretch to 2Mbps upstream, but ideally a fibre connection is required for 1080p streaming, which would provide 10Mbps+ speeds on the upstream.

CAUSING A SCENE

In the main walkthrough, we quickly skipped over creating a scene. Scenes are very powerful, as each one supports multiple sources combined together into the final stream. Adding more than one source enables you to add standing text, a background image, a background slideshow or even multiple windows.

If right-clicked, these various sources can then be layered (using up and down controls), resized, moved or hidden entirely using 'Edit Scene'.

This level of flexibility means that (potentially) for broadcasting gaming events, you can have webcam or camera feeds of commentators or players superimposed over gaming feeds, having them hidden and shown. For doing general software tutorials, it enables you to have the main window displayed unhindered by other controls and then have them appear. The capture can even be confined to a specific area of a window.



Multiple sources are not an issue.

JARGON BUSTER

AAC OR MP3

AAC is better than MP3, producing better quality at the same bit rate – it also supports multichannel surround, too. We'd guess MP3 is less intensive to encode for slower systems.

RESOURCE HOG

Gaming and encoding don't mix very well, so close down all other processes. Ideally, if you're streaming to a drive, try to use a separate one from the one you use for boot and gaming.

The last ingredient to the streaming solution is the PC itself. On the whole, even an aging system is going to manage to squeeze out a small trickle of a steady stream, while newer systems will handle a full jet-wash of streaming fun. Part of this does rely on you having a capable gaming card from Nvidia or AMD, but we're taking that as a given.

PROCESSING POWER

On the processor side of things, using first, second and third-generation Intel Core i5/i7 processors, you can happily stream 30fps at 1,920 x 1,080. For the more capable Core i7 systems with free overhead, 60fps will be an option. On the whole, AMD processors aren't that strong for encoding, but AMD FX quad-core and better models should be fine up to 30fps. For Phenom I/II and Intel Core Duo, weaker encoding capabilities are going to limit the video to 480p resolutions and at most 30fps, while even this could impact gaming performance. Obviously, plenty of memory is going to help smooth things along, too, with at least 4GB being required, while we'd recommend 8GB for a smooth time.

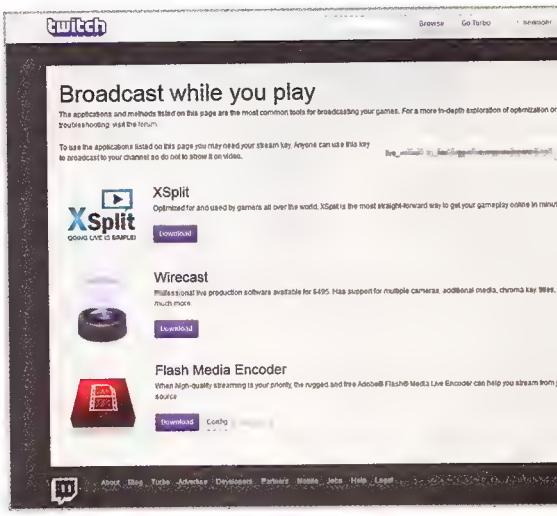
For base 720p live video streaming, none of this is out of reach of even a modest system and home broadband setup. Stretching to 1080p does require having better hardware and ideally a fibre optic connection, but that doesn't rule out doing a local recording, which you can upload later on.

KNOW YOUR STUFF

The patronising part where we tell you to install things.

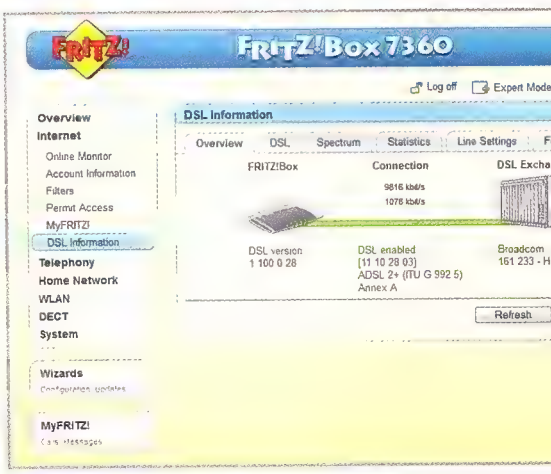
01 KNOW YOUR KEYS

You'll want to download and install OBS, as well as create a Twitch account. Importantly, to use Twitch you need the unique stream key. It's not obvious where this is, though: from the 'Dashboard', click 'Streaming Apps > Show Key' button at the top-right of the screen. This needs to be copied and pasted into the 'Broadcast Settings', which we'll get to later.



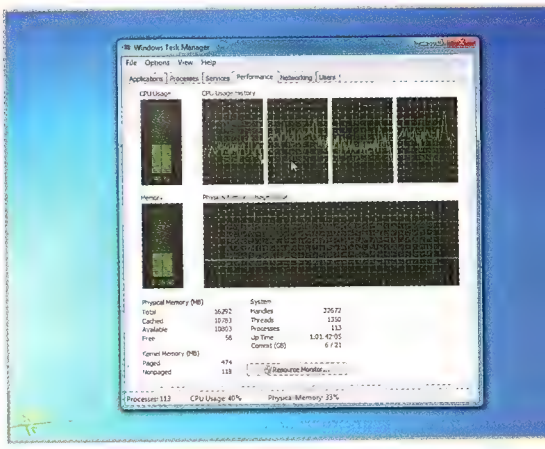
02 KNOW YOUR SPEED

To get the maximum quality from your connection, you're going to have to know how fast your upstream speed is. One way is to dig out the reported speed from your cable or ADSL broadband modem, hidden in the 'Internet/DSL settings' sections – this should give you a fairly accurate figure. The less accurate alternative is to use something like **www.speedtest.net**.



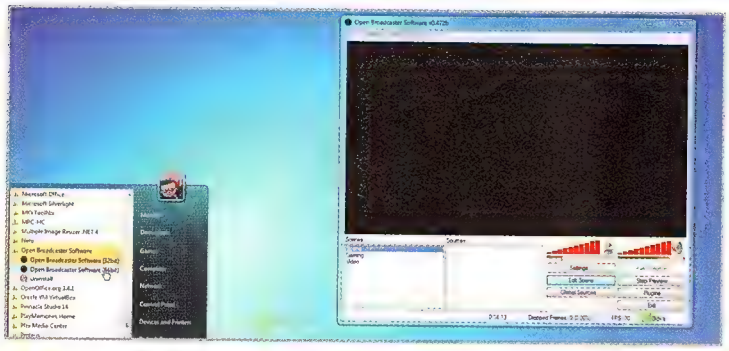
03 KNOW YOUR LIMITS

We've outlined software settings for hardware configurations in very general terms. Of course, with a huge variety in graphics cards and CPUs there's no one-size-fits-all solution. It's well worth keeping the Windows Task Manager open to keep an eye on CPU usage across the cores – a smartphone or tablet is also handy for checking your live stream in a way that's separate from your system.



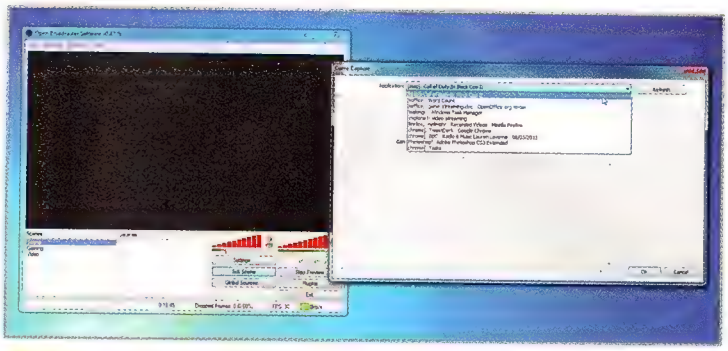
WE ALL STREAM FOR ICE STREAMS

Get videos of your gaming antics online in no time.



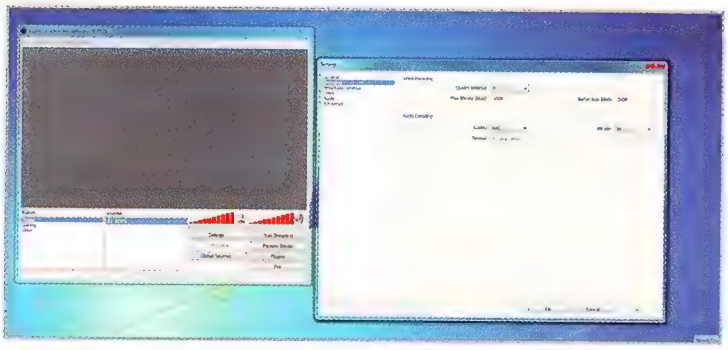
01 WELCOME TO OBS

OBS installs a 32- and 64-bit executable, but the desktop icon links to the 32-bit version. Launch the 64-bit one from the OBS 'Start' menu entry or wherever that is these days with Windows 8. The interface is pleasingly simple – the main area is a preview or display of your stream, with the controls on the bottom-right of the screen and the presets on the bottom-left.



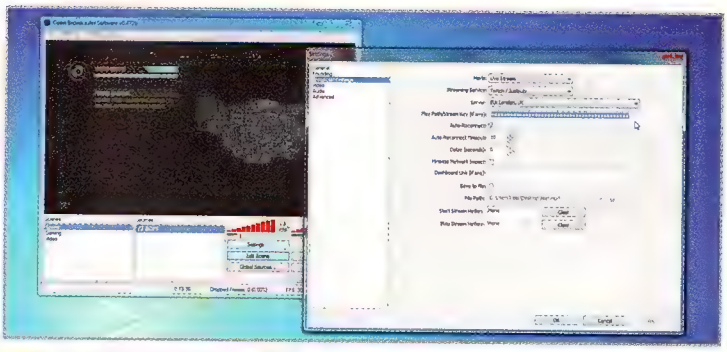
02 ADD THE SOURCE

Let's add a source via the bottom-left list. Right-click a blank area of 'Scenes' and add one called 'Gaming'. At this point you'll need to run the game you want to capture. Just for practise, let's stick with window mode, so we can see what we're doing. Right-click and select 'Sources > Add > Game Capture', then enter a suitable name and select the game from the pull-down menu.



03 BEING PROFILED

Click the 'Settings' button and you'll be able to create a streaming profile. Use 'Setting Profile' to add a name and create multiple profiles. Under 'Encoding', ensure you set the 'Max Bit rate' to around 80% of the total available to you and then leave the buffer and quality set to six. We'd suggest using AAC at 96Kbps for audio, but you can set it lower.

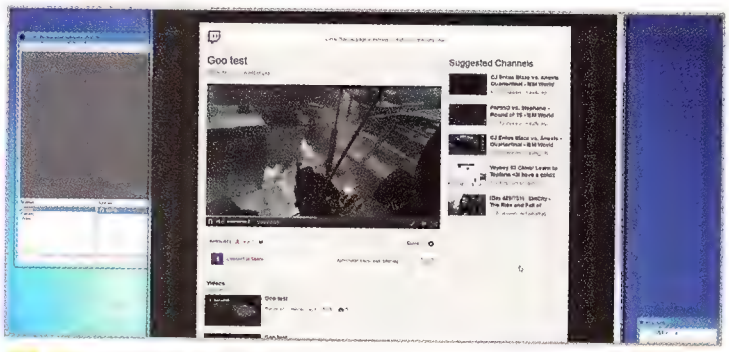


04 BROADCASTING HOUSE

Select 'Broadcast Settings', set 'Mode' to 'Live Stream' and 'Service' to whichever default service you've decided on. Choose a local server for better speed and enter the key. Under the 'Video' section, leave the 'Base' at your native display, but select a suitable downscale resolution and FPS for your system – we'd imagine for most this will be around 1,280 x 720.

05 STREAMS AWAY

You can use 'Preview' to check that OBS is capturing the image correctly, otherwise it's just a matter of clicking 'Start Streaming' and switching to your game. It's not recommended, but we didn't have any issue watching the live stream on a second monitor via **www.twitch.tv** in a browser. Note that there's a delay based on your buffer size.

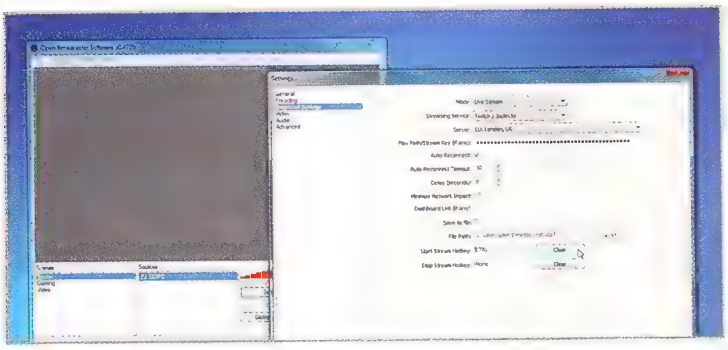


06 CROSS THE STREAMS

It's worth testing for just a few minutes during some intense gameplay. Handily, Twitch will save your clip so you can watch it later. You'll want to do this to check for video quality, issues with sound and to see if the stream is steady. Issues tend to be based around a lack of CPU time for encoding or a lack of upstream bandwidth.

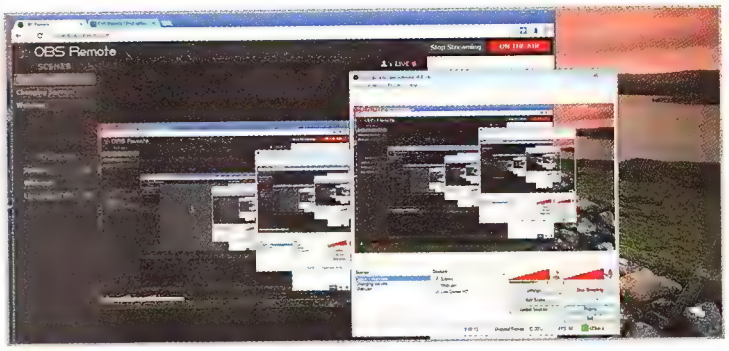
EXPANDING OBS & DOING MORE

A few tweaks will help you get a little more from OBS.



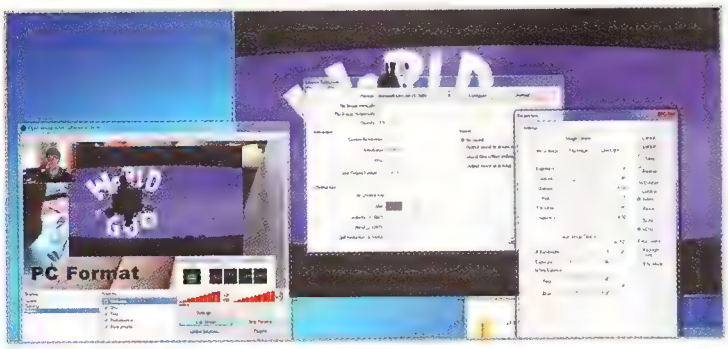
01 HOTKEYS BABY

Let's set hotkeys to start and stop streaming from within your game. This means you don't have to worry about switching in and out during gameplay. The streaming hotkeys are found under the 'Broadcast Settings' and these are specific to each profile. Audio has its own set of hotkeys to mute and unmute both the general desktop audio and any mic input.



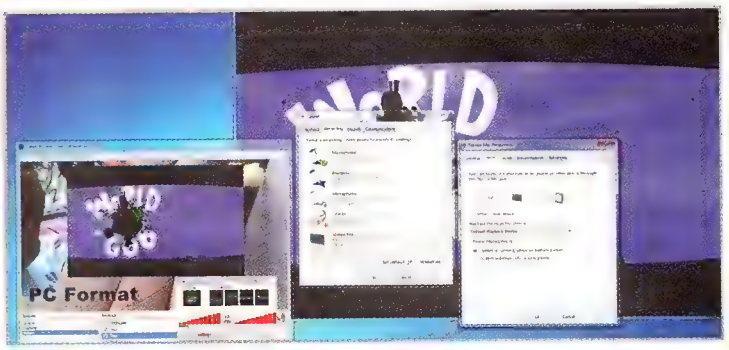
02 PLUG-IN CONTROL

OBS supports plug-ins, but doesn't really have any of its own. One of the two available is OBS Remote over at **www.obsremote.com**. This is an alternative way to control OBS via a web browser running on another networked system. It comes with its own installer and as long as you know the host PC's IP, it's easy to use and brings the most out of the interface.



03 MORE SOURCES

The source system can be fairly complex (see 'Broadcast to the world' below for more details). One aspect it includes is 'Video Capture Device', which means if you have a webcam attached, you can integrate live video of yourself straight into a stream. Another trick is to use the software capture 'Sub-Region' to grab just an area of a window, or you can try overlaying multiple windows on top of the same stream.



04 AUDIO FEEDS

The only weak area of OBS – and this is actually down to how Windows handles audio – is the audio mixing. You're limited to a combination of microphone and main desktop audio. There's no simple way to separate individual program feeds, so you'll be listening to all the audio at once; however, certain audio chipsets do offer ways of splitting feed via their driver software.

BROADCAST TO THE WORLD

It's impressive just how quickly you can have an HD gaming stream set up and broadcasting to the entire world. With no experience of Open Broadcaster Software or even a Twitch account, we were up and running with a test stream within 15 minutes. It doesn't take much longer to realise the full potential of the software and tweak the encoding settings.

The options offered are flexible and far from overwhelming – you're actually advised the advanced settings are mostly unnecessary, unless you have a specific issue that needs to be resolved.

We've mainly talked about how OBS can be used to broadcast live streams of your gaming sessions, but that's just a tiny slice of its potential. If you want to do a gaming session or walkthrough on YouTube, it's a perfect system, and the Twitch tie-in enables live broadcasting as well as archiving it for all time online. A switch of the 'Broadcast 'Settings will redirect that feed to a file on your hard drive instead, for editing and uploading later on.

Overall, you're only limited by your upstream speed and your imagination. Even the basic audio controls will be good enough, allowing you to switch between a mix of desktop and microphone audio.

Much of this relies on the live broadcasting service you use – we're suggesting Twitch, as it's designed for gamers. For other types of events, you may find one of the other services caters your needs better, such as linking with Facebook.

YouTube: a community, not just a host.

Dual-boot Ubuntu

Alan Dexter explains how to get ahead of the crowd and start Linux gaming today.

YOU'LL NEED THIS

UBUNTU 12.10
Download the latest version at **www.ubuntu.com.**

UNIVERSAL USB INSTALLER
Visit **www.pendrivelinux.com** for a free tool to make bootable USB drives.

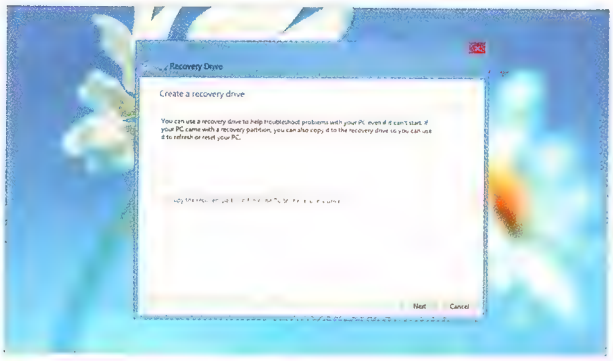
Windows isn't the only operating system you can run on any of your gaming PCs. While there's still some way to go before it hits the mainstream ease that Microsoft has achieved with Windows, the latest Linux builds can be used effectively for play as well as work. The installers have come a long way, too, particularly in terms of their user friendliness, and there's not a command line interface in sight.

There are three main ways to try out Ubuntu: actually installing it, playing around with it in a virtual machine or using Wubi, which means you don't have the scare of upsetting your existing partitions. However, if you want to run Steam on Ubuntu, then you're going to need to install it for real because Steam doesn't run in a virtual machine with 3D acceleration turned on.

We'll walk you through the process of installing Ubuntu alongside your existing Windows installation, although the same process works if you want to simply install Ubuntu as the only operating system on a second machine. We strongly urge you to have access to a second machine, though, just in case anything goes wrong with your first steps into the world of Linux.

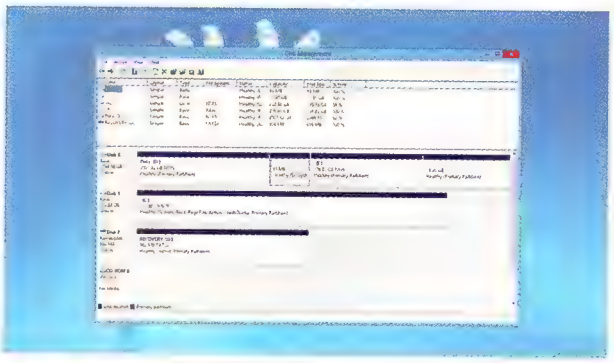
TRY OUT UBUNTU

Get a taste of tomorrow's gaming, today. Go on, you know you want to.



01 DO A BACKUP

Back up your machine. When it comes to installing a whole other OS on your PC, the chance of losing your stuff is far greater. In fact, assume you'll lose everything and if you don't, it's just a bonus. Oh, and if you're using Windows 8, take the added precaution of creating a recovery drive.

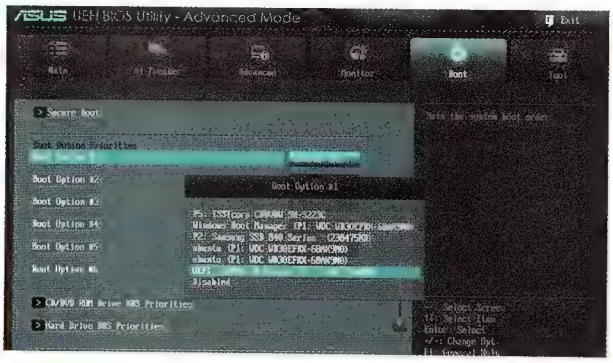


02 MAKE SPACE

Pop into the Disk Manager and make room on the hard drive for Ubuntu by shrinking the current partition. You'll need to free up at least 4.4GB, although to do anything useful we'd recommend around 60GB as a minimum. You don't have to create a new volume, as that will be handled as part of the installation process.

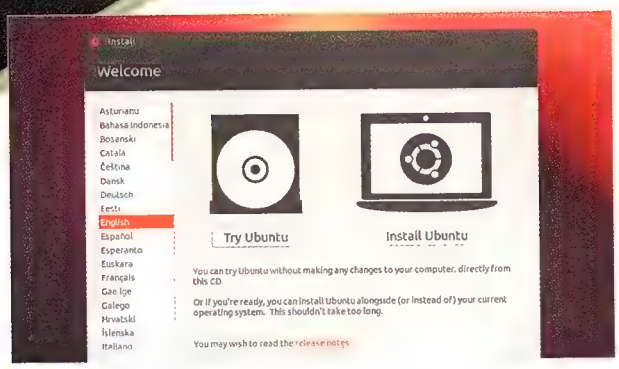
03 BOOT DRIVE

Download the 32-bit or 64-bit version of Ubuntu from **www.ubuntu.com**. If you're packing a modern motherboard with a UEFI BIOS, grab the 64-bit version, as the 32-bit version will probably fail during installation. Grab the USB installer app from **www.pendrivelinux.com** and run it to create a bootable USB drive.



04 START INSTALL

Go into your BIOS, track down the boot order section and elect to boot from a USB drive. Turn on your machine with the USB drive plugged in and the Ubuntu installation should start. If not, restart and hit F8 as it boots, and you should get the 'Boot options' menu. If not, check your motherboard's documentation.

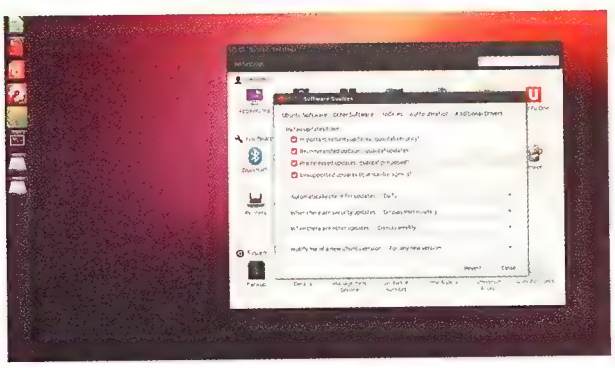


05 RIDING SHOTGUN

The Ubuntu installation process is straightforward and shouldn't throw you any curve balls. Just make sure you install Ubuntu alongside your current version of Windows – it'll find your space automatically and set up the partitions. Create a password and you'll get plenty of chances to type it in as you use the OS.

06 GRAB STEAM

Once the installation has finished and your machine has rebooted, you'll be presented with the latest Ubuntu interface, called Unity. When you're ready, open Firefox, point it at **www.steampowered.com** and click the link to install the Steam beta software. You'll be prompted to install other packages alongside it.



07 UPDATE YOUR DRIVERS

Ubuntu ships with working drivers for newer graphics cards, but updating them is a pain. Go into 'System Settings > Software Sources' and make sure the 'Pre-released updates' option is checked under the 'Updates' tab, then click the 'Additional Drivers tab', select the latest drivers then 'Apply changes'.

08 PLAY GAMES

You should now be able to play some of your Steam games under Ubuntu. It depends on what you own, but if nothing else you'll be able to try your hand at *Team Fortress 2*, which is now free to play. If you have any problems, it's probably down to graphics drivers – search the Ubuntu forums for answers.

HTML

PART 10

Using CSS3 transforms

In this month's instalment of our HTML5 masterclass, John Allsopp extends the use of animations with CSS3 transforms.

APC EXPERT

JOHN ALLSOPP

With a background in computer science and mathematics – and a great deal of good fortune – John Allsopp's life collided with the web in the early '90s. For nearly 20 years he has developed software for web developers, built web sites and apps, and written books, countless articles and tutorials for print and online publications. In 2000, he wrote *A Dao of Web Design*, which over a decade later continues to be widely cited as the theoretical foundation for Responsive Web Design.

In the previous two articles in this series, we looked at two different ways of animating the content of a web page, first using CSS3 transitions and then the slightly more complex CSS animations. We've all most likely seen slick transition effects in iOS, Android and on other mobile platforms, so this month we're going to learn how to combine CSS3 animation techniques with something new, CSS transforms, to create similar eye-catching effects.

WHAT ARE TRANSFORMS?

CSS transforms allow us to take particular pieces of a web page – a heading, a paragraph, indeed all the way up to a whole page – and rotate, scale, skew and translate it, both in two dimensions and even in three dimensions (which is how we'll achieve the well-known card flip-style animation).

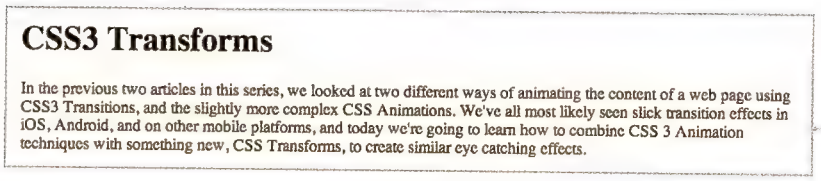
Just as we can add a border, a box shadow and other CSS properties to an element, we apply the CSS3 `transform` property to any element to transform it. The `transform` property takes one or more values that specify what transformation(s) should occur on the element. Let's start with something quite simple and work our way up. This time, we'll concentrate on 2D transformations, while next time we'll tackle 3D transformations.

TRANSLATION

Translating an element involves moving it left and right, up and down – and with 3D transforms, even 'into' and 'out of' the page. Let's begin by translating an element to the right and downwards from where it would otherwise be placed on the page. A quick note, some browsers, in particular Internet Explorer 9 and webkit-based browsers such as Chrome and Safari, require prefixes (`ms-` and `-webkit-` , respectively) for transforms to work. As we saw last time, IE first supported transitions in version 10, while Safari requires the `-webkit-` prefix for transition properties.

```
h1 {
        transform: translateX(45px) translateY(45px);
}
```

Compare how the page is rendered before and after we apply this transformation.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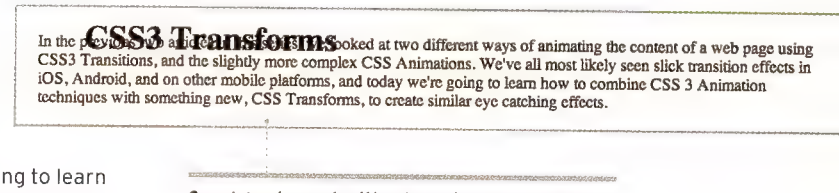
Our `h1` element with no transformation applied.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Our `h1` element with a transformation applied.

OK, so it's not a particularly attractive effect, but it illustrates some important things about transformations.

First, the value of our `transition` property is one or more functions, each separated simply by a space. The first functions we're seeing are `translateX` and `translate` . Each takes a length value (here we've used pixels, but we can also use ems or percentages). The browser applies these functions to the element, transforming it from how it would otherwise be rendered.

By using a positive value for `translateX` , we're moving the element to the right; a negative value would move it to the left. Similarly, a positive value for `translate` moves an element down the page and a negative value up the page. It's important to note that the location 0 is at the top left-hand corner of the element as it would normally be rendered in the page, not the top left-hand corner of the page itself.

The last important thing to note at this stage is, like relative positioning, the rest of the page is rendered as if the element hasn't been transformed. This is helpful to us as developers: the non-transformed parts of a page will be rendered exactly the same in browsers that don't support transformations as they are in browsers which do, aiding backwards compatibility. However, this also introduces the challenge of either designing with transformations in such a way that they'll be legible and attractive in both older and newer browsers, or using a technology like Modernizr, and providing slightly different designs for browsers depending on whether they support transforms.

You might be asking yourself, how is this any different from simply changing the relative position of the `h1` element? In a visual sense, it's not. Underneath the skin, it's very different. If you were to inspect the document's object model when we apply a relative position, the value at the top and left of the object are changed. But if we simply apply a transformation, the top, left and other box properties aren't

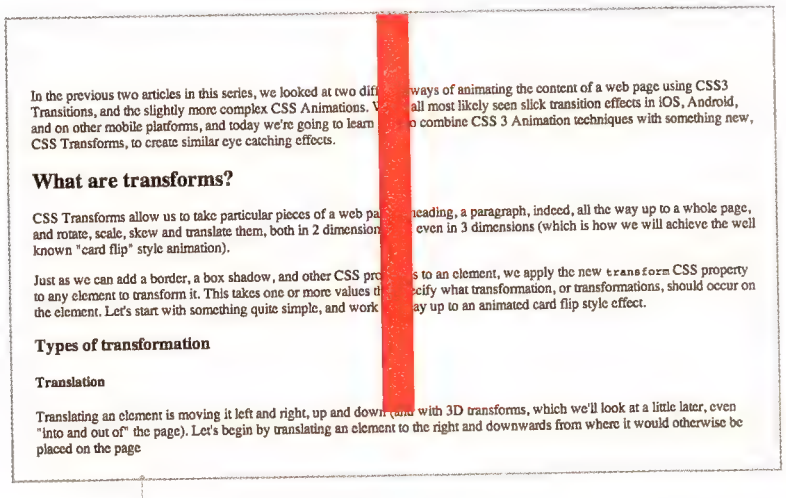
changed. From the DOM perspective, it's as if the element had no transformation applied to it at all.

ROTATING ELEMENTS

While we can visually emulate `translateX` and `translate` using positioning, most transformations can't be emulated. This includes rotating an element. Here we can use the `rotate()` function as a translation value, with a value in degrees. Let's use this to rotate our `h1` element by 90°.

```
h1 {
        transform: rotate(90deg);
}
```

Note that the value of the function takes a unit of `deg`. Let's see what happens. I've added a red background to the element to make things clearer.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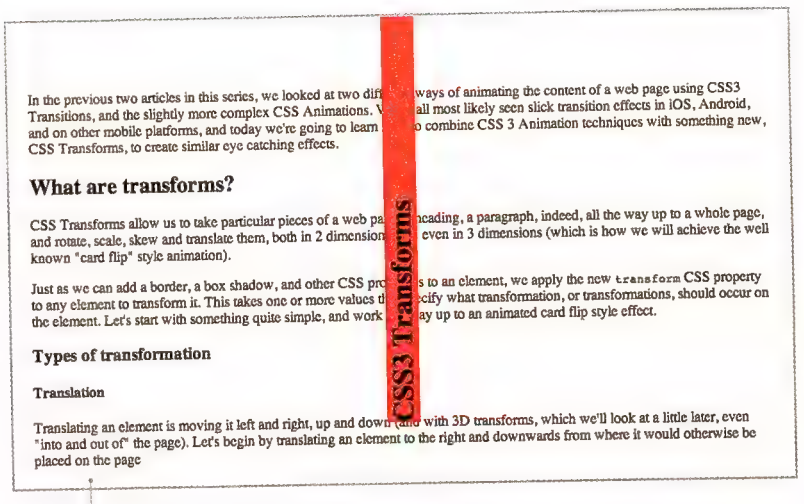
Our `h1` element rotated by 90°.

So what exactly is happening? Where's our text? Well, when we rotate an element, we need a point about which to rotate it. We could rotate around the centre, the top, left-hand corner or any other point of the element. By default, a `rotate` transform rotates an element around its centre, clockwise for positive values and anticlockwise for negative values. This means the text of the element has rotated above the top of the window, so all we can see is the right-hand half of the heading element, now rotated by 90°.

Here's our same element, rotated anticlockwise (`rotate(-90deg)`).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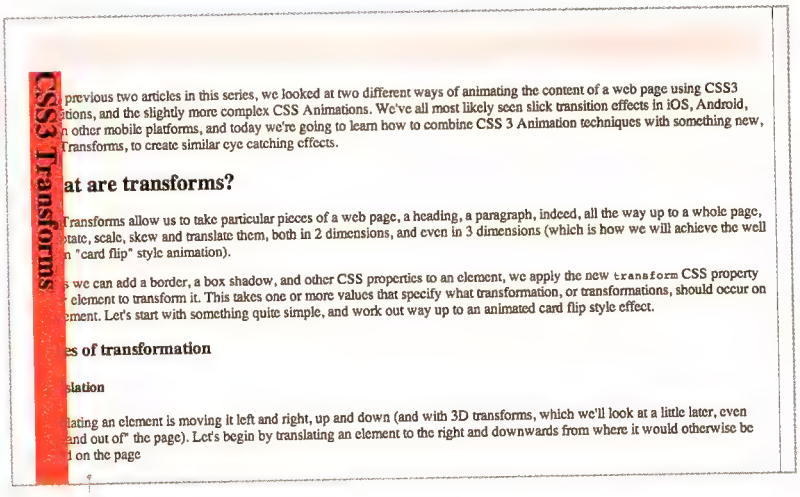
CSS3 Transforms

Our `h1` element rotated counter-clockwise by 90°.

We can now see the text of the element. However, we often won't want to rotate around the centre of an element. There's another property related to transforms, `transform-origin`, which allows us to specify the origin of transform operations. In the case of rotations, it specifies the point around which we rotate an element.

The `transform-origin` takes two values, which specify the horizontal and vertical origin for the transformation. Typically, but not always, we'll use percentage values. In the case of translation, it doesn't matter where our origin is, but for rotation it's very important. To rotate our element around the top left-hand corner, we'll use it `transform-origin: 0 0 ;` to rotate around the top right-hand corner, `transform-origin: 100% 0 .` Let's rotate our element 90° around its bottom left-hand corner.

```
transform: rotate(90deg);
transform-origin: 0% 0%;
```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CSS3 Transforms

Our `h1` element rotated clockwise by 90° around its bottom-left corner.

To demonstrate the rotation, I've left the original unrotated heading faded out.

Even without animating our transformation, rotation gives us a new page layout tool. Until now, to have text rotated on a page, we've needed to use an image of the text we want – a technique to be avoided for numerous reasons, including accessibility, page load times and maintainability. Now, in all modern browsers including IE 9 and 10, we can rotate text on a page.

Here's a design for a conference program, which happens to be the conference I help organise, just to show I 'eat my own dog food' when it comes to CSS3! The heading for each section of the program is rotated 90° counter-clockwise, around the bottom left-hand corner and translated to the left, so it appears beside the entries for that session. In browsers that don't support transforms, the heading appears above the entries.

Design
Samantha Thebridge
Developers will design: let's make them amazing at it
Jay Rogers
Avoid opinionitis
Sara Wachter-Boettcher
Getting unstuck: content strategy for the future
Mark Boulton
Adapting to responsive design
Lea Verou
More CSS secrets: Another 10 things you may not know about CSS
Andrew Fisher
Datatium — radiation free responsive experiences

Rotated headings in the Web Directions South 2012 program.

This isn't just eye candy, as the heading for the group of presentations remains on the screen longer as you scroll down the page, rather than disappearing almost immediately. We therefore provide context for the reader longer with rotated headings than headings that appear at the top of a section. If you want to see the design in action, it's online at **tinyurl.com/dyp4ojx**.

COMBINING TRANSFORMATIONS

As we hinted at a little earlier, we can combine transformations to both translate *and* rotate an element at once, for example. We'll rotate our heading by 45° around its bottom-right and then translate it to the right by, say, 50%.

```
h1 {
        transform: rotate(45deg) translateX(50%)
}
```

To keep you on your toes, here's a little quiz. Which of the following will our resultant page look like?

Will our element appear as above right? Or below right?

It's in fact the first page. This may seem counter-intuitive, but remember, transformations all take place relative to the element transformed, not the page. So, when we rotate the element and then translate it horizontally, this means horizontally with respect to the now rotated element, not horizontally on the page. If we reversed the order of the functions, translating first and then rotating, we'd get the second screenshot.

MORE 2D TRANSFORMS

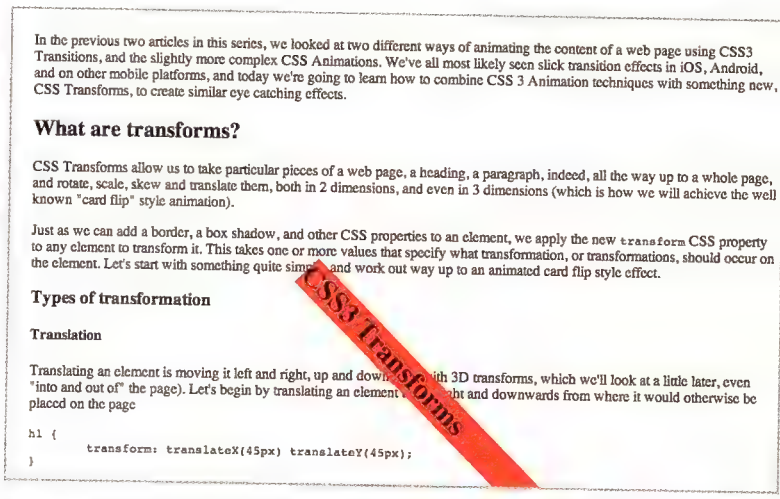
There are more 2D transforms, including `scale` (which lets us zoom up or down the size of an individual element) and skew (either horizontal or vertical). Skewing an element takes its rectangle and turns it into a parallelogram, something you likely won't want to commonly do, but the command `scale` works very nicely with animations and will come in much more handy.

For example, we can make an element increase in size when it has the focus or a cursor hovered over it, or make an element zoom away when it's no longer required (you've likely seen this with model overlays in web pages).

`scale` in 2D is a simple function, which takes a number greater than 0. Numbers less than 1 shrink the size of an element (.5 shrinks it to half its size, .1 to one-tenth), while numbers greater than 1 increase their size; for example, 2 doubles its size. For fun, we'll make a quarter-sized thumbnail image of our entire page.

```
body {
        transform: scale(.25);
        transform-origin: 0% 0%
}
```

Note that once again, we've got a `transform-origin`, this time the top left-hand corner of the page. Because our transformed page will end up smaller than the original, we want to keep the top left-hand corner fixed.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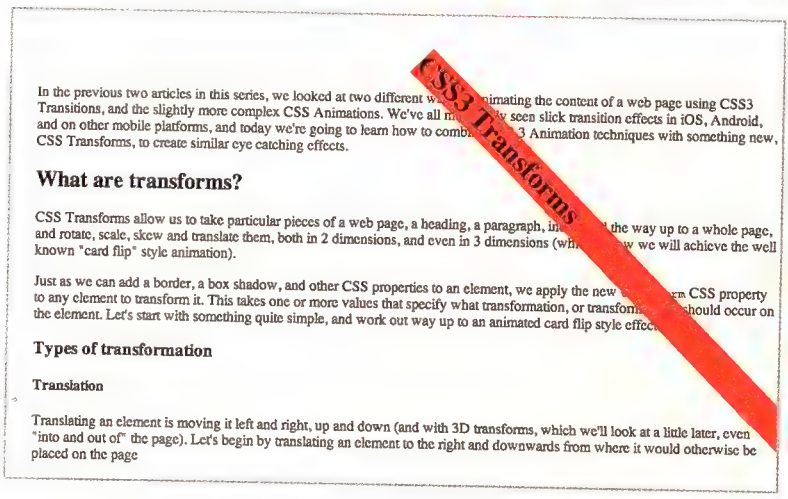
        transform: translateX(45px) translateY(45px);
}
```

CSS3 Transforms


In the previous two articles in this series, we looked at two different w… animating the content of a web page using CSS3 Transitions, and the slightly more complex CSS Animations. We've all m… y seen slick transition effects in iOS, Android, and on other mobile platforms, and today we're going to learn how to comb… 3 Animation techniques with something new, CSS Transforms, to create similar eye catching effects.

What are transforms?

CSS Transforms allow us to take particular pieces of a web page, a heading, a paragraph, in… the way up to a whole page, and rotate, scale, skew and translate them, both in 2 dimensions, and even in 3 dimensions (wh… w we will achieve the well known "card flip" style animation).

Just as we can add a border, a box shadow, and other CSS properties to an element, we apply the new … m CSS property to any element to transform it. This takes one or more values that specify what transformation, or transform… should occur on the element. Let's start with something quite simple, and work out way up to an animated card flip style effect

Types of transformation

Translation

Translating an element is moving it left and right, up and down (and with 3D transforms, which we'll look at a little later, even "into and out of" the page). Let's begin by translating an element to the right and downwards from where it would otherwise be placed on the page

CSS3 Transforms

Or, here's how we scale up a button when it's under the pointer:

```
button:hover {
        transform: scale(1.25);
}
```

ANIMATING TRANSFORMS

As you can imagine, transforms really start coming into their own when they add some dynamism to our page or application. We can easily create a sliding panel effect, as we commonly see with mobile applications, simply by using `translateX`. Here, each of the 'panels' in our application will be a section element with the class "panel", like so:

```
<section class="panel" id="panel1">
        <header><button>Back</button></header>
        <!-- put our functionality here -->
</section>

<section class="panel" id="panel2">
        <header><button>Back</button></header>
        <!-- put our functionality here -->
</section>
```

By default, we'll place our panels off to the right-hand side of the screen, out of sight. To do this we'll first position them absolutely in the top-left corner of the page and then translate them 100% to the right.

```
.panel {
        position: absolute;
        top: 0;
        left: 0;
        width: 100%;
        transform: translateX(100%);
}
```

We'll also specify that when the panel is transformed, we'll animate that change using a CSS transition:

```
transition: transform 1s
```

Then we'll create one last class which can be applied using JavaScript to a panel when it is the current panel (let's call it `active-panel`), to bring it into view:

```
.active-panel {
        transform: translateX(0%)
}
```

So now, when our panel becomes the active one, it will slide into view and the old one will slide out of view. Of course, we sadly can't show you this in the magazine, but here it is in full glory if you want to take a closer look: **tinyurl.com/cnrlc97**. OK, so it's not the most compelling of applications just yet, but with just a little CSS, we've built the foundations of a common user interface pattern for a mobile application.

Similarly, we might have an overlay window on our page, which when dismissed, doesn't simply vanish but zooms 'into' the page.

```
.modal {
        width: 30%;
        margin: 20% auto 0 auto;
        transform: scale(0);
        transition: transform 1s
}

.modal-active {
        transform: scale(1);
}
```

As you might guess, we'll simply use a little bit of JavaScript to change the class to or from `modal-active` to zoom the modal overlay from 0 (and therefore, invisible) to its regular size. And by adding a transition, this takes place over a second, giving a zoom effect.

Once again, it's very hard to demonstrate in print, but head over see it in action and delve into the code at **tinyurl.com/ckndr2e**.

However, where these effects get really exciting is when we use 3D transforms, which is what we'll be doing next time.

MORE EXAMPLES

The excellent design team at Neon Three has come up with some slightly more attractive animations using 2D transformation at **www.neonthree.com/template6**. For example, we can rotate an element continuously using just a little bit of CSS animation, like so:

```
@keyframes spin {
  from { transform: rotate(0deg); }
  to { transform: rotate(360deg); }
}

.animated {
        animation-name: spin;
        animation-duration: 4000ms; /* 40 seconds */
        animation-iteration-count: infinite;
        animation-timing-function: linear;
}
```

As we saw last time, this will infinitely smoothly apply the animation called 'spin', over a 4-second period. Take a look at the CSS for the design to see how the other animations are achieved.

BROWSER SUPPORT, BACKWARDS COMPATIBILITY & MORE

OK, so how widely supported are transforms? And what happens when they aren't? Firstly, every widely used browser from IE 9 and up supports CSS 2D transforms (we'll cover 3D transform support next time). That means we're really only concerned about IE 8 and older. As we mentioned, IE 9 and webkit-based browsers (including on iOS and Android) require vendor prefixes, so for now, in addition to `transform` we'll also need to provide `-ms-transform` and `-webkit-transform` properties.

There are two approaches to dealing with older browsers. We can apply transforms carefully, so that the result in browsers that don't support `transform` is still usable and acceptable. This is likely to be the case by default with animated transforms, but much harder to achieve with transforms used for page layouts.

The other option is to use Modernizr and provide different layouts depending on whether CSS transforms are supported.

NEXT TIME

Next time we'll finish up our CSS transition, animation and transform odyssey with 3D CSS transforms.

TOOLS, EXAMPLES & FURTHER READING

If you want to explore and understand CSS transforms more, here are some tools and resources to help you.

- As always, the wonderful Can I Use is your guide to up-to-the-minute and legacy browser support: caniuse.com/#search=transforms
- My HTML5 and CSS3 tools let you explore CSS transforms: tools.webdirections.org/#transforms
- For an even geekier exploration of 2D transforms, here's an in-depth article I wrote a couple of years ago: tinyurl.com/3gtudeu
- For something fun, take a look at the opening titles of the original *Star Wars*, using transforms, animations and HTML5 audio!
- A roundup of some visually stunning uses of transforms from *.net* magazine: tinyurl.com/8yytamy

PROJECT 7

Retro Gamebox

Who needs a PS4 when you've got an Arduino? Darren Yates shows you how to build a retro games console for around $30.

APC EXPERT

DARREN YATES

Darren is a multi-award-winning journalist who started building and testing computers in the early '90s. He's developed a range of PC software, including *PC User*'s UserBench benchmark series starting in 2005, its UserOS Linux distros in 2008 and is now working on new benchmarks for Android when he's not busy writing or torturing hardware with his soldering iron.

HACKVISION ARDUINO GAME SKETCHES

You can find the original games available at **tinyurl.com/bpnzqkf**. To make it easier, we've put together each game as a separate ZIP pack, with all the required libraries included. You can grab them from the *APC* web site at **apcmag.com/arduino.htm**. **Note:** Make sure you read through 'Programming it & hooking it up' on page 103 for special information on uploading *Space Invaders* to your Retro Gamebox.

The games market may well dwarf the music and movie industries combined in global revenue, and new-release games offer lighting effects and texture detail that make you forget you're in a game and not a movie. But there's always something that tugs us back to retro gaming – the blocky graphics, corny 8-bit sound and those golden memories.

Our Arduino microcontroller doesn't come with a video output, although we showed you in our January issue (see page 108) how you could hook it up to the composite video input of your TV and display your own TV weather channel.

So this month, we're combining all this knowledge and putting together our very own retro arcade games console we're calling the Retro Gamebox.

WHAT YOU NEED

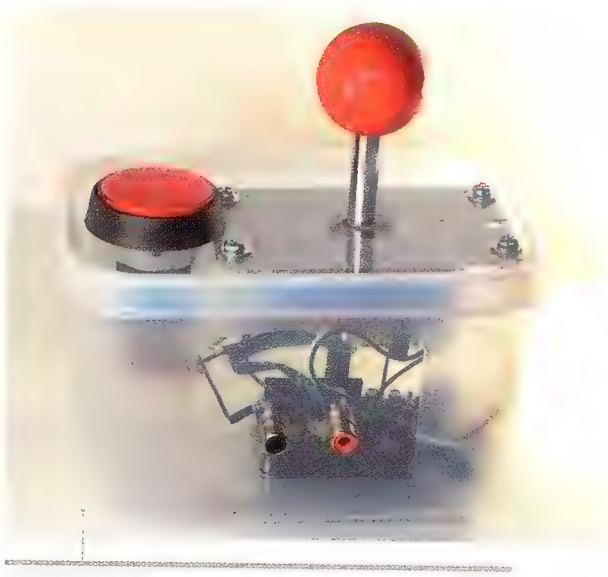
Apart from the Arduino Uno board, the main components you'll need are the arcade-grade joystick and fire pushbutton. They look impressive, but they're not expensive. We picked up ours from eBay – the joystick for $8.79 and the pushbutton just $3.50, both including shipping.

How the single-fire pushbutton works is pretty straightforward: the button plunger operates a normally open (NO) microswitch, which closes when the button is pressed. A nice extra is that many also have an LED inside the button top.

The joystick is a little more complex – it has four NO microswitches, one for each compass direction, which operate as you pull the central control around. Some arcade joysticks have a mechanical locking mechanism that will lock off one axis (X or Y) so you can use it more easily; for example, locking off the Y axis so the controller becomes a side-to-side type for playing *Space Invaders*.

PARTS LIST

Part	Cost	Source
Arduino Uno R3	$13.20	tinyurl.com/cn9lrh2
Eight-way arcade joystick	$8.79	tinyurl.com/bsqpjt5
Arcade pushbutton	$3.50	tinyurl.com/cgwnv9k
Dupont wires	$2.55	tinyurl.com/bt4932l
Red RCA socket	$0.95	tinyurl.com/cuklwn5
Black RCA socket	$0.95	tinyurl.com/czlebfk
900ml kitchen food container	$2	Local $2 shop
2 x 470ohm 0.5W metal resistor	$0.46	tinyurl.com/cv8lw34
1 x 1kohm 0.5W metal resistor	$0.46	tinyurl.com/clu2q2z
TOTAL COST	$32.86	



Our Retro Gamebox is built into a see-through container.

Whether you're building a full-on replica arcade gaming machine or just our little Gamebox, the joystick switches do the same job: they connect to the circuit board and when activated, cause the software to change operation based on the switch(es) pressed.

So that you can see the insides of our design more easily, we've gone for a basic see-through food container. If you're really keen, you could put the whole thing together into your own full-scale retro arcade machine.

GAMES

The inspiration for our project this month came from the Hackvision system developed by Nootropic Design (**nootropicdesign.com**). It's a basic cut-down custom Arduino with four direction buttons and a fire button, all built onto a single printed circuit board. You can buy it as a prebuilt device ($44) or a kit you put together yourself ($34). However, since the Arduino code for a number of games – including *Space Invaders*, *Asteroid*, *Tetris* and *Sudoku* – has been released to open source, we decided a game box with existing Arduino hardware would be a worthy inclusion into our project list.

The main problem with the Hackvision system is the lack of USB connectivity, requiring you to come up with your own USB-to-TTL adapter cable to program it. By using a standard Arduino in our Retro Gamebox, changing games is as simple as plugging the Gamebox into your PC's USB port and compiling the new Arduino sketch.

How it works

Our Retro Gamebox is surprisingly simple when it comes to hardware: five switches, three resistors, a couple of RCA sockets and that's about it. Well, it's a little more complicated than that, but when you boil it down, that's all there is from an electronics viewpoint.

Arcade-grade controllers use four microswitches around a central control lever.

HOW THE ARCADE JOYSTICK WORKS

Four of the five switches belong to the arcade joystick. Mechanically, an arcade joystick is just a centre bolt that pushes the actuators of four microswitches wrapped around the outside. Each switch has two connectors: the contacts are the NO type that close when you move the joystick and actuate the switch. The trick with arcade joysticks is they operate the opposite switch to the direction of movement. So pushing the bar up activates the bottom switch; pushing it left operates the right switch and so on.

Electrically, the switches are used to effectively create an interrupt pulse within the Arduino and cause it to perform a function based on which switch is pressed; for example, when we want our rocket ship to move in a certain direction.

In the Gamebox, the digital inputs these switches are wired to are set to activate when the switch pulls that input to ground (the 0V rail). That means we can join one connector of each microswitch together and wire it to ground, creating what's called a common ground. This allows us to use just five wires from the joystick to the Arduino (one for each switch and the common ground), instead of eight (two for each switch).

HOW THE FIRE BUTTON WORKS

The fire button works slightly differently – it has just the one switch, but two modes of operation. The switch has three connectors: a common connector plus one that's NO and one that's normally closed (NC). With the switch resting, the common pin is electrically connected to the NC pin. When you press the switch, that common pin then connects to the NO pin and disconnects from the NC pin.

The switch we've used here also has a built-in LED and current-limiting resistor. What we've done is hook up the anode side of the LED to the Arduino's 5V pin and the cathode side to the pin that connects the switch to the Arduino (D10). The result is that the LED lights up whenever the fire button is pressed. Combine that with the blue power LED on the Arduino board and you get a neat little light show.

A good-sized fire button is a must-have for any games console!

VIDEO/AUDIO OUTPUT

Thanks to some impressive coding from Myles Metzler and others, the video and audio output that connects to your TV requires only three resistors and one of those is optional. We won't cover how it works here, but briefly, composite video requires two electronic signals: the analogue video data plus the synchronisation pulses that tell the telly where the data is meant to be on the screen. Two resistors are all that's required to combine the signals into one composite video output with the correct voltage ratios your TV will understand.

The audio output is really simple. The Arduino creates genuine 8-bit pulse-width modulated (PWM) sounds straight out of pin D11. We've added a simple 470ohm current-limiting resistor to ensure that output pin doesn't blow up if it's accidently grounded. That output goes directly to your TV's audio input and gets blasted out the speakers.

The Gamebox features composite video out and 8-bit sound via its two RCA ports.

NO POWER SWITCH REQUIRED

Once you've programmed the Arduino with your choice of game, it'll launch it straight away. High scores are saved in the Arduino's small EEPROM memory, so they're saved even when the power goes off. We've not bothered with a power switch, although you could integrate one into the build if you wish.

Putting it together

You can put the Retro Gamebox into any container you want, so we've chosen a food container for its low cost and transparency. Full-size arcade games are impressive but we wanted you to see what's going on inside and hopefully give you the idea that it's not that complicated.

USING A FOOD CONTAINER

We've used a 900mL food container from the local $2 shop and if you follow this route, you need to take care when drilling into plastic. First, set your drill speed to slow, otherwise you'll tear the plastic to shreds. Second, don't push too hard against the plastic to get the drill bit to bite, otherwise you'll split the plastic. Don't use cheap takeaway containers, but a sturdy microwaveable type. You could also use a Jaycar 'jiffy box' (**tinyurl.com/cc57xpz**), although we like the see-through look. The other thing we'd do differently next time is mount the RCA sockets towards the edge of the container where the plastic is a little stronger (it'll handle connecting and removing cables much more easily).

MOUNTING THE COMPONENTS

We've used standard M4 machine screws on the joystick with washers on either side of the plastic lid (one under the bolt head, another before the nut). You can pick these up from any hardware store. We ended up using a tapered reamer to size the hole for the joystick rod. However, the fire button requires a sizeable 24mm hole for the centre shaft. If you don't have a hole saw, the easiest way is to pick your centre point and measure 10mm out to eight points around in the circle. You then drill pilot holes at each point and expand them out using a 3mm drill bit. You then snip around the outer perimeter of the plastic joining those holes with a pair of side cutters (food container plastic is soft enough for this). After that, you'll find you can just push out the centre piece, leaving a 24mm hole you can push the fire button shaft through.

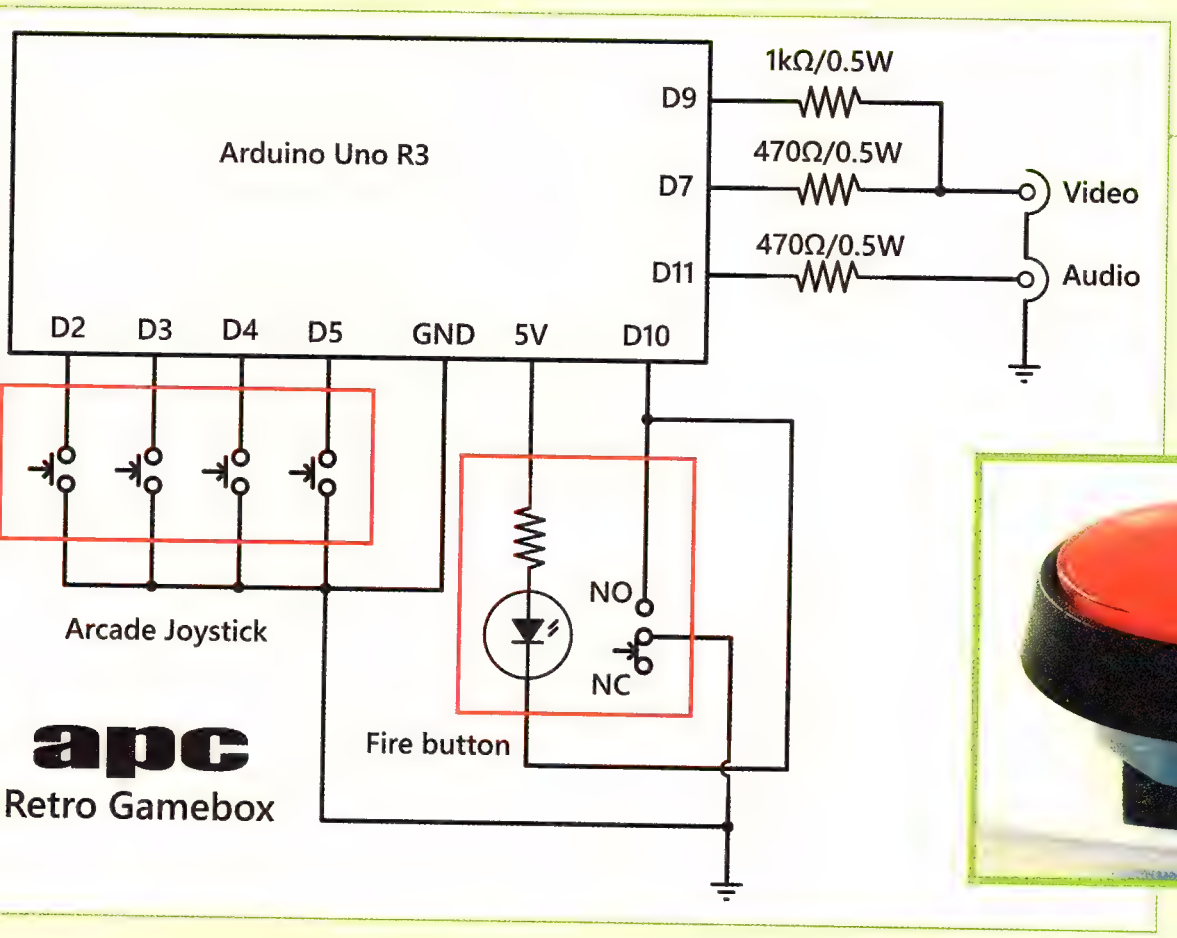
The fire button itself comes apart – grab hold of the microswitch bottom section, twist and pull it to unlock. That'll give you the top shaft section, which you can feed through your case and anchor with the large plastic collar nut. There are different types of arcade pushbutton switches so your mileage may vary.

We raised the Arduino board off the bottom of the container using 5mm spacers (Jaycar) and 15mm M3 bolts (Bunnings), which fit into the Arduino's four mounting holes. Don't forget the washers on either side of the plastic before you add in those spacers. Using a see-through container makes it easy to mark out the mounting hole positions with a Sharpie before you drill. Finally, don't forget the holes for the DC power socket and the USB port.

WIRING UP THE COMPONENTS

Our build method requires no direct soldering to the Arduino board. Instead, we used Dupont male wires, cutting off one end, soldering it into position and pushing the pin on the other end into the appropriate header hole on the Arduino board. The Arduino header sockets grab Dupont pins pretty well, so you shouldn't have to worry about them falling out unless you start drop-kicking the Gamebox around. We also used a small amount of standard hook-up wire to connect the common ground on the joystick and the fire button LED to the fire button's NO contact.

Just make sure you don't wire everything so short that you can't take the lid off easily. Really, how you build it is up to you – as long as you follow the circuit diagram, you can build it on a lump of wood if you like and it should still do the job.



The Retro Gamebox's circuit diagram is pretty simple.

Place washers directly against the plastic so you don't split it.

Programming it & hooking it up

Although these classic games were originally ported to work on the Nootropic Design Hackvision board, we've designed the Gamebox so they'll happily work here, too. Provided you've followed the circuit diagram when building your Gamebox, all you have to do is download the required files and libraries for each game onto your PC, compile the Arduino sketch and upload it to your Gamebox – no game code needs to be harmed in the making of this project.

To make it easier, we've put each game together with a package of libraries your Arduino IDE will need in order to compile it. They're based around Myles Metzler's excellent Arduino TVout library, Nootropic Design's controller library, which handles the joystick and fire button plus other libraries where appropriate.

For all games other than *Space Invaders*, just copy the contents of the 'libraries' folder across to your Arduino IDE's \libraries folder and overwrite any existing files. With *Space Invaders*, you especially need to delete any existing TVout folder and replace it with the one bundled with the *Space Invaders* code. You then need to compile the sketch code and program your Arduino. The *Space Invaders* port was written for an older version of TVout and won't work with the current release – that's why you need to delete any previous version and use the specific version including the ZIP file.

We used the latest version 1.0.3 of the Arduino IDE available from **arduino.cc/en/main/software**.

HOOKING IT UP TO YOUR TV

This is the fun bit. Use a standard stereo pair RCA cable and connect one side into the Retro Gamebox and the other end into the composite video and audio inputs of your TV or monitor. Go with a 3m or 5m cable to give you enough length that you're not sitting on top of the telly to play. Powering the Gamebox, you'll need a 9VDC or 12VDC power brick with the centre pin positive and the other ring negative. The Arduino pulls no more than 50mA, so just about any correct voltage/polarity power brick should work. You could also power the Gamebox with a USB power adapter from your smartphone or tablet and plug a USB cable into the Arduino – we've tested this and it works just fine.

PAL OR NTSC?

By default, Gamebox is set to deliver US-based NTSC-standard video. That's not a problem for modern TVs, as they all handle NTSC and Australia's PAL video system, but if you're planning to run this on an older CRT TV that's PAL only, add a wire from D12 to ground to tell the Arduino you want PAL video output. Apparently, this also speeds up gameplay for some reason we haven't figured out yet; most likely due to the change in video frame rate from 60Hz to 50Hz. Arduino only does monochrome video, so don't expect to see flashy colours.

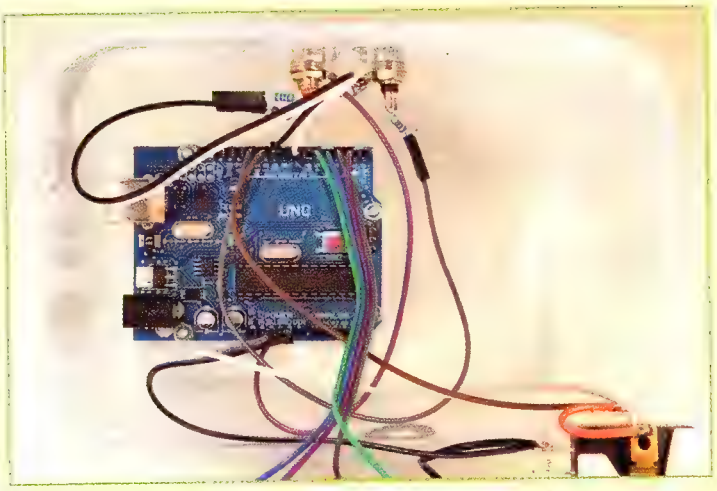
Turn the TV volume down a bit before you start, as the Arduino's audio output can be a maximum 5V peak to peak, and don't forget to select the appropriate TV input to see the video.

To reset the Gamebox, just pull the power out and plug it back in again. You could add in a small pushbutton switch that pulls the RESET pin to ground, but that's entirely optional.

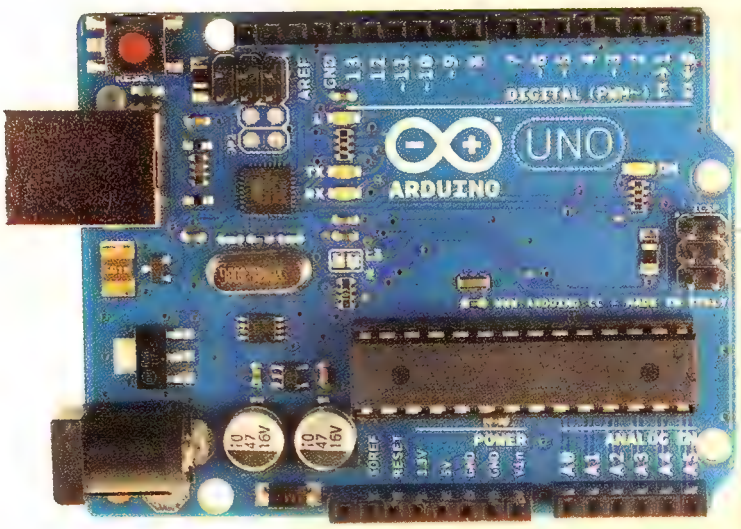
WRITING YOUR OWN GAMES

Once you've had a play for a while, why not have a bash at writing your own games? If you're thinking about gaming, a simple setup like the Retro Gamebox will help you understand what makes good gameplay without getting sidetracked with producing eye-popping graphics.

Peer through the Arduino sketches for each game to glean ideas and head to the Nootropic Design web site for more details. Don't forget the Arduino web site (**arduino.cc**) for more on coding the Arduino.

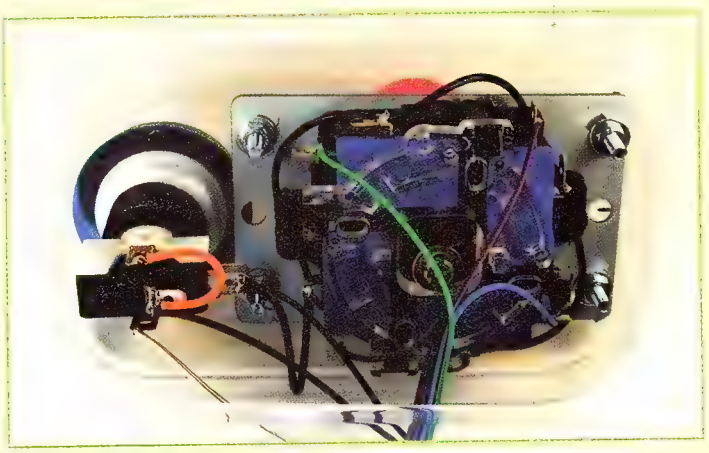


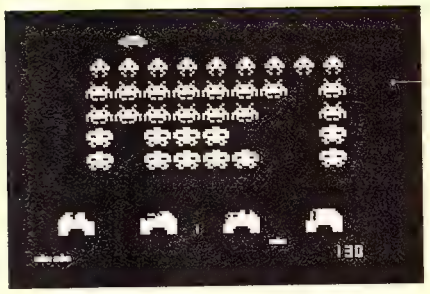
We've soldered the output resistors directly to the RCA sockets. It's not ideal, but it's quick.



Our Retro Gamebox uses a standard Arduino Uno microcontroller board.

You can use proper spade lugs to solder the joystick and fire button switches or solder direct as we did.





The classic *Space Invaders* still rocks!

Flash your phone back to original

Rooted your Android smartphone/tablet or changed the ROM, but now want to go back to genuine firmware? Darren Yates shows you how using the Samsung Galaxy S III phone.

APC EXPERT

DARREN YATES

Darren is a multi-award-winning journalist who started building and testing computers in the early '90s. He's developed a range of PC software, including *PC User*'s UserBench benchmark series starting in 2005, its UserOS Linux distros in 2008 and is now working on new benchmarks for Android when he's not busy writing or torturing hardware with his soldering iron.

Rooting your phone and even trying out new ROMs is part and parcel of being a hardcore enthusiast. Ditching the corporate bloatware from phone network providers – the prime reason for rooting – is tantamount to ditching the corporate advertising and getting your phone back. But community ROMs don't always match the hype, particularly when it comes to extracting your phone's full features list.

It's usually then that some decide they'd rather go back to what they had. If you're running a Samsung Galaxy S II or S III phone and you've tried the latest CyanogenMod ROM, you might be missing the ability to connect your phone to your TV, for example.

So the big question is: can you put your phone back to the way it originally was?

YES, YOU CAN GO BACK

It's easy to get a bit caught up in the advanced nature of rooting and flashing your phone, and see it all as a bit of a dark art. But if you remember your phone is just a portable Linux computer, changing ROMs becomes changing the OS and it suddenly seems less daunting.

The best rule of thumb for changing a ROM in your phone is to always be methodical in what you do, never panic and give your phone time to do what it needs to do.

In very simple terms, bringing your phone back to original condition is all but the same as putting a new ROM on it – because that's exactly what you're doing. However, there are several ways to do it, depending on where your starting point is.

FIRST THINGS FIRST: BACK UP EVERYTHING

It should become as second nature as breathing – any time you change your phone's ROM, back up everything. Storage is cheap; getting data back that you haven't backed up isn't. We use two methods. First, we use the 'Recovery Mode' Nandroid backup to make a complete backup of the phone, which is basically a snapshot of the phone as it is. Second, we use combinations of Android apps to back up the phone – we sync email, contacts and calendar with Google Sync and back up SMSs with SMS Backup and Restore.

We don't normally back up apps as they can be restored from Google Play. We've never had much luck restoring apps when changing from one OS to another – not surprising, really. You probably already know how much Windows likes to be copied from one computer to another. Anyway, the general idea is to back up everything and copy the backup files to your PC – don't leave them on your phone.

DANGER, WILL ROBINSON!

Flashing your phone will null and void your warranty. While we have successfully tested the processes described in this story, we offer no support or guarantee. You try them at your own risk.

METHOD #1: NANDROID BACKUP

If you were a good *APC* reader and performed a Nandroid backup before you flashed the new ROM, you can just back up your personal data (email, SMS and so on) and restore that Nandroid backup. The downside is, you'll be sending your phone back in time to the point you made the backup, as everything after that date will disappear from your phone until you reinstall them from your new backups. This method basically returns your phone to its previous ROM.

METHOD #2: INSTALL A NEW STOCK ROM

If you forgot to do a Nandroid backup or it hasn't worked, all isn't lost. Another option would be to take the latest available stock ROM from your phone's manufacturer or your network provider and install that onto your phone. The downside here is that most stock ROMs are a generation (or possibly two) behind the latest available release. For example, Optus just released its Android 4.1.2 ROM for the Galaxy S II in late March, despite 4.2.2 now being the latest benchmark.

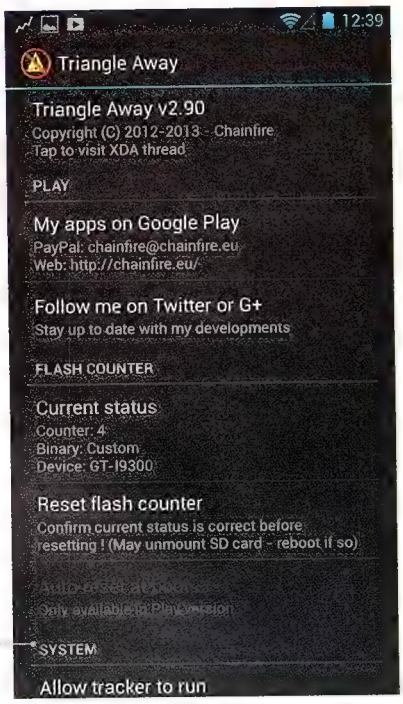
WHERE TO GET YOUR ROM

Samsung is like most phone makers, preferring to deliver new ROMs as over-the-air (OTA) updates rather than as a downloadable file you install yourself. However, if you've installed a non-stock ROM, the ability to get updates OTA will likely have been removed. So where can you download stock ROMs? For Samsung owners, head to Sammobile (**www.sammobile.com/firmwares**). It's the most complete list of stock ROMs by phone provider we've seen for any smartphone, let alone just Samsung mobiles.

WHICH ROMs?

If you're going to get into the habit of flashing ROMs onto your phone, we think it's always a good idea to understand

Samsung's Galaxy S II has a new Stock 4.1.2 firmware available.



The Galaxy S III can be brought back to stock with Samsung's ODIN tool.

Triangle Away can be used to reset the S II/S III's flash counter, but it's not without significant risk.

HOW MANY TIMES CAN I FLASH MY PHONE?

The NAND flash storage inside your phone can support many hundreds of write cycles so it's unlikely you'll kill your phone's storage by flashing a new ROM. The bigger issue comes if you flash a new Radio ROM (the code that talks to the phone's wireless connectivity electronics). Flash a dud Radio ROM and you may well brick the phone. While no-one can give you an iron-clad guarantee, chances are you'll have a new phone before you reach your phone storage's flash write limit.

exactly what you're doing. And when it comes to phone ROMs, there's more than meets the eye.

When you load a new OS onto your PC, you're installing high-level code that interacts directly with the user. It contains the code that runs your apps and provides the basic apps like Windows Explorer and so on.

In your phone, the equivalent is colloquially referred to as the Phone ROM. It's the high-level Android operating system you interact with. But it's not the only ROM your phone uses.

Your PC's motherboard has a low-level firmware called the BIOS (basic input/output system), a code set that communicates between the hardware and the operating system, like talking to hard drives and setting the CPU clock speed. Your phone's equivalent here is commonly called the Radio ROM and its function is to handle the wireless hardware electronics in your phone. However, just to be different, Samsung uses different terms:

- **PDA.** This refers to the Android operating system ROM version code, although it doesn't obliquely refer to Android in any way (just to make it easier... not).
- **Phone.** What everyone else calls the Radio ROM is Samsung's Phone ROM, handling the modem and wireless connectivity electronics.
- **CSC.** This stands for Consumer Software Customisation. It's a ROM separate to the PDA ROM, which contains the corporate bloatware specific to your network provider and your geographic location.

We'll talk more about these later, but for now, it's just enough to understand what these Samsung terms mean and how they correlate to terms you'll read online.

PICKING THE RIGHT ROM

As we've mentioned previously, the most important aspect of picking a stock ROM is making sure you get the right one for your phone model.

If you have the standard 3G version of the Galaxy S III as sold in Australia, its model number should be GT-I9300T (you can find it on the Samsung splash screen when your phone first boots). The international version is known as the GT-I9300, while the 4G version is the GT-I9305. And when you head over to Sammobile, these are the model numbers you need to look up your model.

The reason it's so important that you pick up the right download is because Samsung stock ROM packages include both the PDA and Phone ROMs (the operating system and the Radio ROMs). So while a PDA ROM for another phone might work, a different Phone/Radio ROM probably won't and will very likely brick your Galaxy.

BEWARE THE BUGS

The other thing you need to be careful of is making sure that you don't choose too old a ROM. For example, if you're running a Galaxy S II, don't choose an Android 4.0.4-based ROM, otherwise you could end up bricking your phone through the Galaxy S II Superbrick Bug. The S III isn't immune either, with its own Sudden Death bug plaguing Android 4.0.4 ROMs. Unfortunately, it means we can't just tell you to get the latest ROM and you'll be right – you should try to keep up with phone trends, particularly your model, and be aware of what's happening in the market.

In the case of the Galaxy S II and S III phones, new Android 4.1.x-based ROMs have so far proven to be bug-free and should be your starting point for stock ROMs.

HOW TO GET IT ONTO YOUR PHONE

ROM flashing has become so sophisticated that there are three different options available for flashing a Samsung phone.

- **Recovery Mode.** You copy the ROM file onto your phone's storage and

use the phone's built-in 'Recovery Mode' to install it.

- **Samsung Kies.** Allow Samsung's official software to detect the phone and grab the latest official phone/network update and install it.
- **Samsung ODIN.** Grab the ROM and install it yourself via your PC.

Our preference is to use the 'Recovery Mode' or ODIN – we're just not fans of Kies. It worked happily enough with our test Galaxy S III, but it's never picked up OTA updates with our S II. That said, it's a consumer-focused tool so it's not designed to let you get too funky with your phone. ODIN is reportedly a leaked internal Samsung app and potentially more dangerous (because it lets you do dangerous things like repartition flash storage), but if you don't stray too far, it's easy to use and very effective.

WARRANTY RESTORED?

In the old days with phones like the HTC Desire, restoring a rooted phone back to its original condition with a legitimate stock ROM effectively also restored your phone's warranty – mainly because there was no way for the phone provider to tell whether the phone had ever been rooted or ROM'd in the past.

However, the Galaxy S II and S III now have a built-in custom binary download counter that records how many times the phone's storage has been flashed. The idea was that even if you replaced a community ROM with an official one, Samsung would still know you'd flashed it in the past, thanks to that counter, if the phone was ever presented for repairs under warranty.

So the reality here is that restoring your phone to stock doesn't restore your warranty if the flash counter has it registered that you've flashed a different ROM at some point.

WILL A STOCK ROM KEEP MY PHONE ROOTED?

The short answer is no. By installing a stock ROM, you also remove the root access because you're no longer using the same operating system. Think of it as if you were replacing Windows XP with Windows 8 – you don't have the same OS installed so none of the same conditions remain. However, there's nothing stopping you from rooting your phone again with the new stock ROM installed if that's what you want. (Just follow the process we looked at in last month's issue of *APC*).

TURNING BACK THE CLOCK

Winding back the old mechanical odometer in cars was one of the dodgier practices rogue used car sellers would use on unsuspecting buyers and make clapped-out motors seem like they'd literally lived a sheltered life. Well, it's also possible to wind back (as in reset) the binary download counter; however, we don't recommend it.

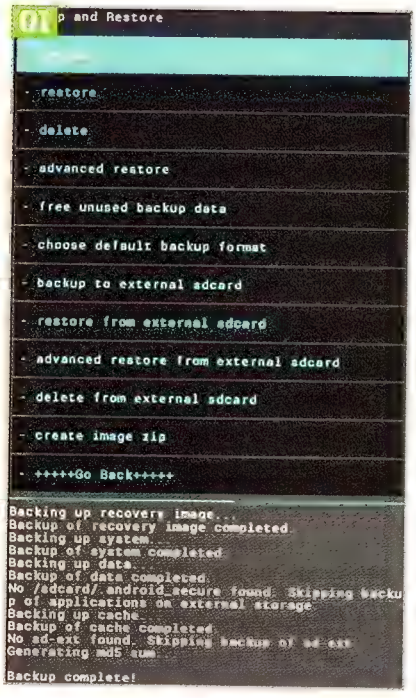
There's an app on Google Play by the ever-brilliant Xda Developer/moderator Chainfire called Triangle Away, which attempts to reset the counter. But because it operates on the phone's bootloader code that

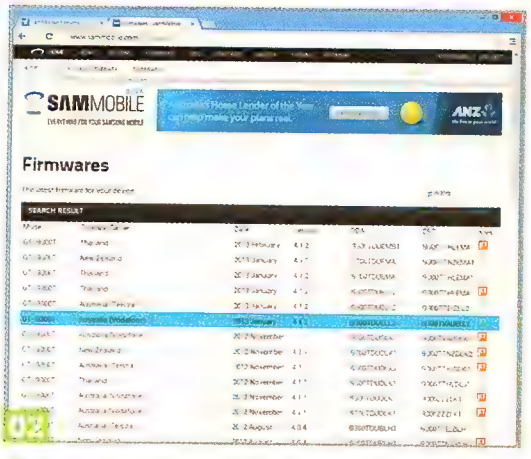
WARNING

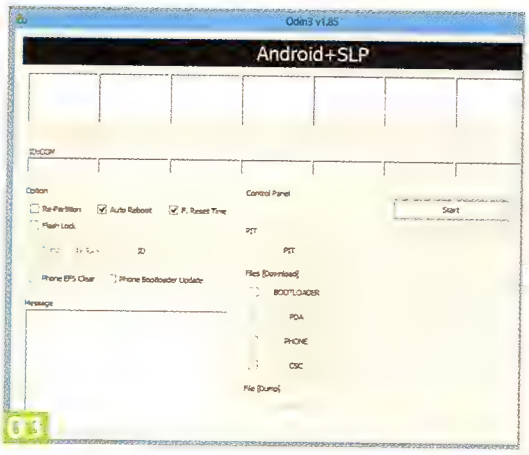
While this guide was successfully tested on a Samsung Galaxy S III, we provide no support or warranty on the information provided. Use at your own risk.

INSTALL A STOCK ROM ON A

01 Charge up your phone to at least 75% capacity. Make backups of your current phone setup using Nandroid (complete phone backup), Google Sync (email, contacts, calendar) and SMS Backup and Restore (SMS). If you haven't already, install Samsung Kies for its USB drivers – we won't be using this software otherwise.



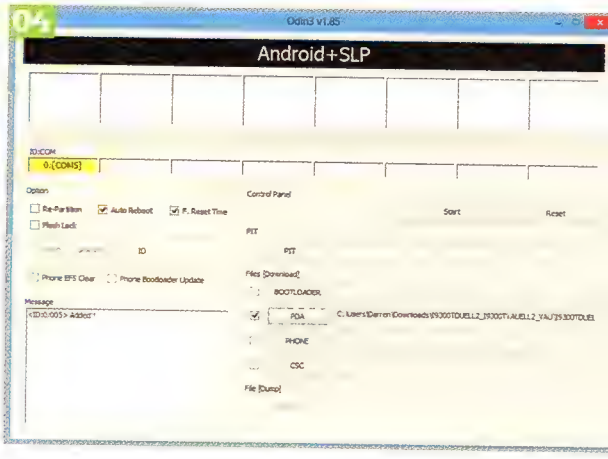


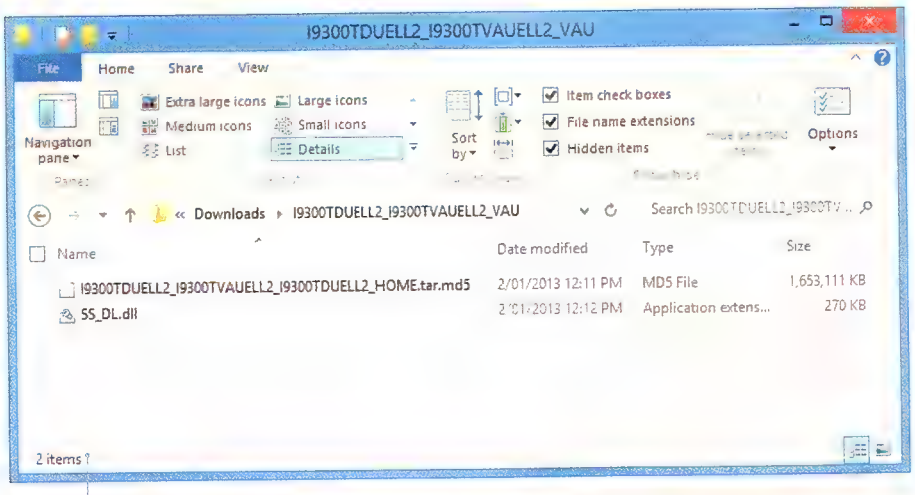


02 Head to Sammobile (**sammobile.com/firmwares**), search for your phone model and select the version that matches your location and network provider. Once downloaded, unzip the contents into a folder on your hard drive. Be warned: S III stock ROMs can be greater than 1GB in size and require up to 2GB to unzip. You should see a large 'TAR.MD5' archive file after unzipping.

03 Download the Samsung ODIN 1.85 tool from **tinyurl.com/d8tcnsu** (requires free sign-up). Unzip it, launch it and with the phone turned off, plug your S III into your PC's USB port.

04 Turn the phone on into 'Download Mode' (press and hold the power, 'Home' and volume down buttons until you see the warning screen). You should see the phone listed in ODIN. Press the 'PDA' button and select the 'TAR.MD5' archive. Ensure the 'Re-Partition' box is unticked.





The latest official Vodafone/Android 4.1.2 ROM for the S III is 10 times the size of CM10.1!

Press the power, 'Home' and volume down buttons to boot the S III into 'Download Mode'.

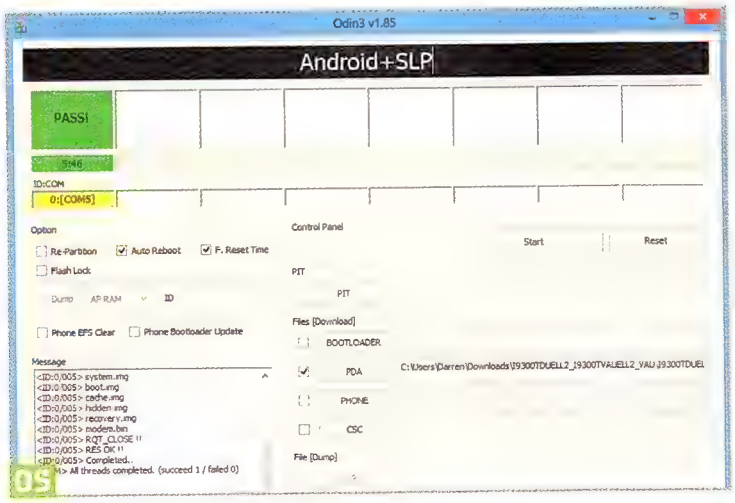
tells the phone what to launch when it first boots, Triangle Away may brick your phone if it doesn't work correctly – not a recoverable brick like an Android ROM flash gone wrong, but a fully unrecoverable brick that requires advanced electronics knowledge (JTAG) or a new board to fix.

If you're seriously worried about warranty, don't flash your phone in the first place. Otherwise, if you're happy to lose your warranty, there's nothing to be gained by resetting the counter, although there's plenty more to lose.

YOU CHOOSE

In the end, it's your phone – you get to choose which ROMs you install. While most community ROMs are generally fantastic at removing bloatware, they don't always give you your phone's full features list and a stock ROM, warts and all, might actually be a better option. There are some good ROMs based on official releases that maintain functionality, but if you want to go back to being safe and conservative, a stock ROM is the way to go.

GALAXY S III USING ODIN

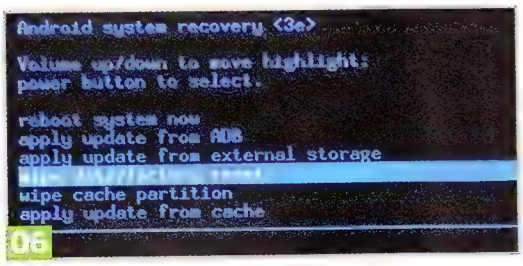


05

Press the 'Start' button and allow ODIN to flash your phone with the stock ROM. It'll take a few minutes but once it's completed, you should get the big green 'PASS' signage. Your phone should now automatically reboot.

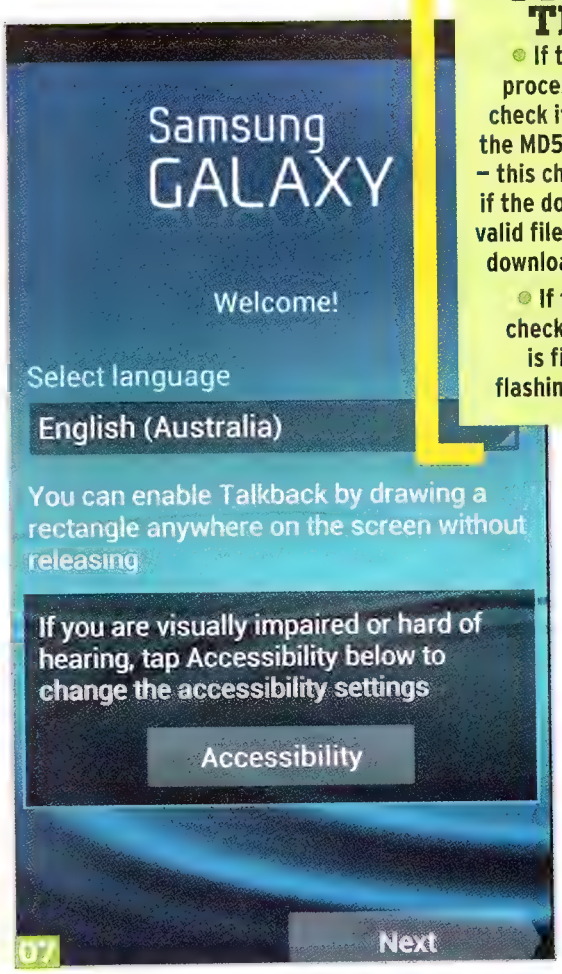
TROUBLESHOOTING

If your phone keeps showing the Samsung splash screen and rebooting, it's stuck in a boot loop. Don't panic – it's a common issue. Provided that you got the green 'PASS' sign in step 5, here's what you can do to fix it.



06

Pull the cover off your phone and remove the battery. Put it back in when the screen goes blank, put the cover back on and boot your phone into 'Recovery Mode' (press the power, 'Home' and volume up buttons until you see the Samsung splash screen). When the recovery menu appears, navigate using the volume buttons to 'Wipe data/factory reset' and press the power button to activate.


Samsung
GALAXY
Welcome!
Select language
English (Australia)
You can enable Talkback by drawing a rectangle anywhere on the screen without releasing
If you are visually impaired or hard of hearing, tap Accessibility below to change the accessibility settings
Accessibility
Next
07

07

When it's done, navigate back to 'Reboot Now' and allow the phone to reboot. It should now come up as normal.

OTHER TIPS

- If the flash process failed, check if it passed the MD5 check test – this checks to see if the download is a valid file. If it failed, download it again.
- If the MD5 checksum test is fine, try flashing it again.

BioShock Infinite

An unbelievable experience, muddled by a confusing plot.

PC

@ www.bioshockinfinite.com $ $78

You're on a balloon-supported flying city in 1912 and that soon drops to being only the fifth or sixth most puzzling thing about *BioShock Infinite*. Who are those two? Why are they talking about me? What's with the giant cyborg bird? What does AD stand for? Why can I shoot crows from my hands? And how do these pants help me reload?

The intro says you're Booker DeWitt, a private investigator tasked with retrieving a girl named Elizabeth. But I played more like a crazed amnesiac looter, scouring the city for spare change and story clues. In cheerful contrast to the original *BioShock*'s deep sea madhouse, the flying city of Columbia is still populated, albeit with magical racists.

It's a pleasure to have a game this substantial to explore and one that gives you the breathing room to do so. You still spend a lot of time killing things, but more than most action games, it knows when to give you space.

Shops, blocks and districts waft wonkily through the air, listing as they cruise in to dock with each other. Bells chime, children play, locals picnic. There's a fair on and everyone's out in their 1912 Sunday best. The sun is dazzling, the views are breathtaking and everyone you meet is chattering happily.

Early on, the times when combat does break out are the low points. There seems to have been some internal rule against adding any exotic weapons, so *Infinite*'s guns stick religiously to convention: pistols, shotguns, three types of machine gun, rifles, grenade launchers and a rocket launcher. However, it does start to get better once you pick up new powers. You acquire magical abilities by downing Vigors, which come in beautiful custom bottles relating to what they do. A lot of the early ones just let you disable and damage a group of enemies by swarming them with crows, setting fire to them, or floating them into the air. You can tweak your abilities a little more with Gear, like the aforementioned pants that mysteriously help you reload. The system is insane and wildly incongruous, but it does allow for some entertaining configurations. If someone walks into one of my crow traps, I can then land on them to set the crows ablaze. If they try to hit me, my hat electrocutes them. And by then they've taken enough damage that my shirt will let me break their neck with one blow. This causes my shoes to heal me, as a reward for getting a melee kill.

The game's biggest fights take place in huge open areas, sometimes several city blocks, and metal Sky Rails snake through the air between them. These rails are inverted rollercoasters: you hold a magnetic wheel gizmo that lets you dangle from them and then ride their curves with improbable speed. This changes the format of combat, so instead of ducking behind cover when you're in trouble, you leap up and ride off, too fast to be hit. As you zoom along you can aim for a landing spot, pounce on an enemy or best of all, leap onto a hoverboat.

I want to tell you why the plot failed for me, but I have to be vague. It has many, many leaps of questionable logic, but the ones that are really smart are when your terrible predicament seems to be the direct consequence of decisions that didn't make sense at all, and the absolute worst culprit is the ending. The plot's final emotional sting is an action that just doesn't seem like it would achieve anything. It seems to be assuming some new fundamental rule about how this world works, but since those rules are never explained, any drama that hinges on them feels a bit arbitrary. In a sense, that beauty makes it even more of a shame that the writing doesn't manage to put all this spectacular work to better use. But it does mean that these moments end up being quite emotional anyway. It's like a surreal arthouse movie where nothing really makes sense, but where each scene is strangely compelling nonetheless.

It's a weird note to end on, after a game that's so magnificent in so many other ways. It doesn't change the conclusion: *BioShock Infinite* is an extraordinary experience and no-one should miss out on playing it.

Tom Francis

✔ Beautiful scenes and spectacular combat set in a breathtaking place.

✖ Slightly muddled plot.

9/10

StarCraft II: Heart of the Swarm

Is *Wings of Liberty* too tough an act to follow?

PC

@ tinyurl.com/b5z9zoo $ PC $44

Remember in *Wings of Liberty* when Kerrigan said to Raynor: "I so love the way you kindle their hope, Jim. By all means bring them all to my doorstep; it'll be like lambs to the slaughter." So cold. From then, the icy Kerrigan has been toned down to an almost humane level in some respects. Granted, she's been chucked into a research facility and emerged with little Zerg DNA intact.

Consequently, the dialogue is quite terribly written and it boringly regales the Queen of Blades' (predictable) mission to unify the Zerg swarm and hunt down anyone who tried to keep her and Raynor apart ("I love you, Jim. Never forget it." Urgh.)

While that's probably the biggest annoyance in this expansion pack, on the flip side the single-player campaign vaunts 20 missions, each with versatile purposes such as taking charge of Raynor's Hyperion and dispersing purple Zerg goo.

Completing mission objectives makes Kerrigan's hero unit grow stronger and you can pick between a few mutations for the Zerg, such as increasing a unit's range.

Special evolution missions will get unlocked at certain points in campaign mode, too, which let you try out two different evolutions for a unit before you pick one.

Multiplayer is a tough affair as always, and the seven new units make gameplay a little more interesting (two each for Zerg and Terran, three for Protoss) while remaining fairly well balanced. A great new feature is 'Take Command', where you can replay a game... from a replay. So if your connection ever drops out, you can pick up where you left off. It's also advantageous for serious gamers wanting to analyse where they went wrong and have another go.

HotS essentially sticks to the much-loved *StarCraft* formula both visually and in practice. But we can't really blame Blizzard for sticking with a winner.

Goldie Hong

- ✓ New units, versatile missions, new multiplayer options such as the Take Command feature.
- ✗ Cheesy dialogue, not as epic as *Wings of Liberty*.

8/10

ARMA 3 – ALPHA TEST

A more realistic shooter than usual.

@ www.arma3.com
Q3 2013 (Release)

PC VIA STEAM

While the console conversion nature of most triple-A titles is still rather evident, the *Arma* games have always been – and hopefully always will be – exclusive to the PC. It could be seen as foolhardy on developer Bohemia Interactive's part, but between *Arma* and *PlanetSide 2*, it's proof that the PC is still the platform of choice for intelligent, grand-scale shooters. The way missions play out is a triumphant slap in the face of *Call of Duty* and *Battlefield*. *Arma 3* is tough, with the thud of projectiles in the earth around you a sure sign that death is imminent, unless you rapidly seek cover. It's still a terrifyingly real experience – more so after playing mindless shooters that cast you as an invincible, self-healing super-soldier type. Improvements to the engine are immediately apparent. The draw distances are astounding – almost unreal. Bohemia claims you can see for 20km in any direction. On top you'll find DirectX 11 support, volumetric clouds and the good, old mission editor. The alpha contains just one island, but it's a tantalising glimpse of what's to come later this year. It's testament to the PC's tenacious nature as a platform, too, and Bohemia's understanding of gamers' patience.

HW

BADLAND

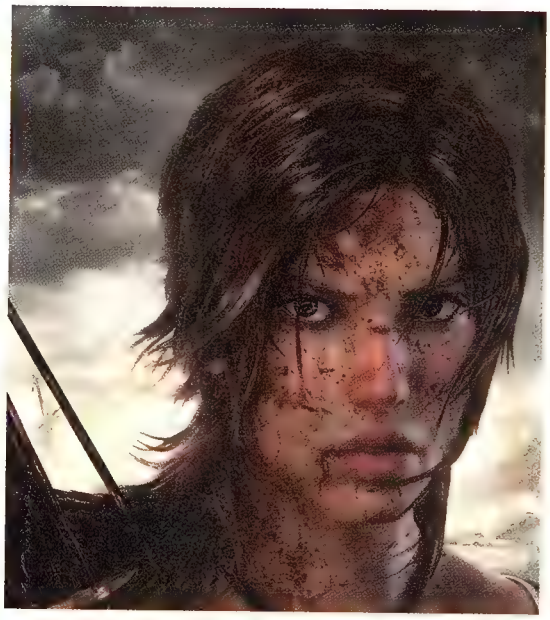
An atmospheric action adventure.

@ tinyurl.com/cloh2el
$ $4.49

IOS

If you love nightmarish side-scrollers with some endless runner action thrown in, then *Badland* is just for you. Taking place in a lush and resplendently colourful forest with a sinister underbelly of grinding gears, platforms, pipes and all manner of sharp things ready to ensnare and hinder your progress, the idea is to help navigate the strange, Furby-esque afro protagonist(s) to the end of the level. It doesn't get simpler than the one-touch control scheme and you're really at the mercy of the environments as you bounce through, around and into obstacles. At times it feels like you're only along for the ride as opposed to actually playing a game, but there's something so quirky about the game that it's hard to put down. It could be succinctly described as a weird hybrid mash-up of *LocoRoco*, *A Crow in Hell*, *Limbo* and your worst fears. I'll generally balk at paying anything over a couple of bucks for an app, so dropping $4.49 is a serious undertaking and while fun, it's tough to recommend from a value perspective. Add it to your watch list and grab it once it comes down in price.

TC



Tomb Raider

Lara plumbs into *Uncharted* territory.

PC

@ www.tombraider.com $ $79

Forget everything you know about Lara Croft and the series because the new *Tomb Raider* wipes the slate clean. The game revolves around the ultimate exploration of the lost Kingdom of Yamatai, an ancient kingdom once ruled by the Sun Queen Himiko, who's said to be able to control the weather. The expedition team gets shipwrecked, washed up on the rocks and at the mercy of Yamatai's twisted inhabitants.

On the gameplay front, *TR* poses an age-old question: which came first, the Lara or the Drake? Yes I know the answer is Lara, I was there in '96, panting sweatily as I hunched over my PlayStation plumbing the depths for pieces of Scion, but the moments where it feels like you covered all this off while playing *Uncharted* are innumerable. Running, shooting, climbing, cinematic actioning, it all feels too familiar.

TR looks stunning on the PC – Lara's animations and physics are lovely, and there's an immersive believability to the wild and often disturbing world around her. Climbing, running and falling all feel weighty and consequential; missing a jump or slide results in Lara taking a crunchingly sickening fall to the ground below, and a wince and sharp intake of breath from us. On a performance front, our modest Core i5-2500K, GTX 570 rig chugged along just fine with almost everything dialled, but the critical break point came with the TressFX hair fidelity settings.

Overall, regardless of its similarities to *Uncharted*, there's still a hefty chunk of fun adventure gaming to notch up. Look on the bright side, it could have been infinitely worse; Nolan North could have voiced Lara.

Troy Coleman

✔ Long, immersive action gaming, great series reboot, looks amazing.
✖ At times feels too much like *Uncharted*-with-the-ladies.

8/10

Metal Gear Rising: Revengeance

Hyperkinetic combat with a military edge.

PS3

@ www.metalgearsolid.com $ $89.95

Metal Gear Rising: Revengeance is insane by every definition, but we mean that in a positive way. It's also about cutting things up into tiny little chunks with incredibly sharp weapons, while guitars blare off in the distance for no reason whatsoever. It's every single action movie cliché you could name dressed up in metal rock, dropped into the body of *Metal Gear Solid*'s resident (and not always loved) cyborg Raiden.

While you might expect the game to be all about the subtle art of stealth and assassination, this version of Raiden is a more combat-heavy type, which is why this is *Metal Gear Rising*, rather than *Solid*; that's also because it's been produced by *Bayonetta* studio Platinum Games as an effective *Metal Gear* spin-off. Combat is *Revengeance*'s calling card, but it's not really a game that's all about attacking.

Very quickly you've got to master effective parrying and it's here that the game falters just a little, because parrying is direction-dependant and sometimes the game moves so fast with so many enemies that it's nearly impossible to block all of them. Mastering when to parry exactly is an art and those who attain it will have a ball with the cast of crazy cyborg characters, once they get past all the cut scenes that play out the beyond ludicrous plot. *Revengeance*'s other calling card is 'blade mode', a first-person cutting experience that allows you to slow time as you slice and dice enemies.

This isn't a game for the younger set or those who find blocking attacks tedious, but it matches its sheer insanity with a dose of fun and is highly addictive.

Alex Kidman

✔ Excellent combat animations, plenty of depth.
✖ Cut scenes make little sense, blocking is hard to master.

8/10

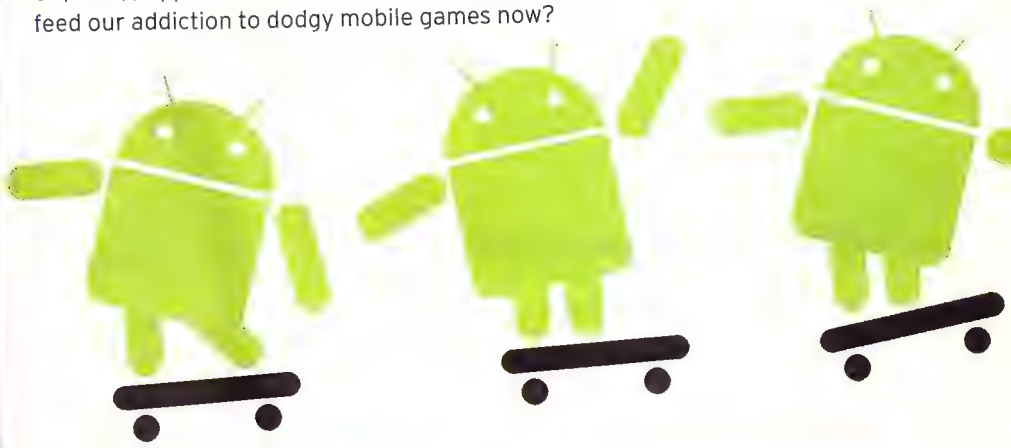
PETER DOCKRILL

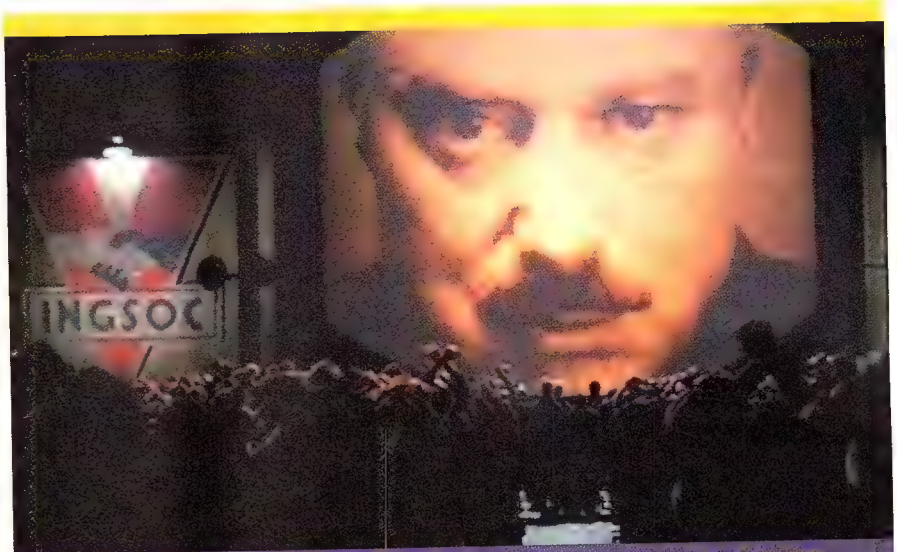
$TARS IN THEIR EYES

How much would you pay to privately message Mark Zuckerberg? Welsh crooner Tom Jones? Perhaps Mike Tyson? Or what about Julia Gillard? While standard Facebook messaging between online acquaintances has always been free, the company admitted recently it does enable users in the US and UK to contact people they don't know (like celebrity accounts, for example). And depending on Facebook's automatic assessment of the exchange, which will look at the follower count of the person being communicated with, the social network may decide to charge you a fee, which reportedly ranges between US$5 to US$100. If you elect not to pay, your message is still received at the other end but finds itself stashed in Facebook's virtually hidden 'Other' messages inbox, which is a de facto spam filter most people never notice. While it's not a bad tactic to help combat the volume of spam famous individuals receive, it still seems a little bit undemocratic to automatically determine that paid messages are legit while free communication is spam. Sounds a bit rich to us.

CLEANING UP SHOP

Let's be honest. Not all app stores offer the same shopping experience. Take Apple's, for example. It's known for being highly restrictive in what it will and won't let developers get away with, and woe befall any app makers who try to flout the rules. In contrast, Google Play has always come across as more of an unregulated market bazaar of sorts. If you want unofficial ports, old school console emulators and apps that otherwise fell off the back of a truck, Google Play has historically had you covered. But now it seems Google is taking a sterilised new approach to selling its wares, having booted a massive 60,000(!) apps out of its catalogue in the month of February. How will we feed our addiction to dodgy mobile games now?





BIG TEACHER IS WATCHING YOU

Technology is making it harder for students to avoid doing their homework... literally. The advent of the modern search engine has already made plagiarism easier than ever to detect; simply by Googling a passage from a suspect essay, teachers can determine if it's ever appeared elsewhere. And now new software by US digital textbook business CourseSmart can report if students aren't reading their set texts. The new technology alerts teachers to when and how students are accessing their digital textbooks (or not), so now less engaged pupils will have to devise fiendish new ways to avoid their study... abc

wansview

SCAN NOW

TO VIEW THE ONLINE VIDEO

* NCH530W

DON'T BECOME A VICTIM! SECURITY IS AS EASY AS 1, 2, 3 WITH THE WANSVIEW IP CAMERA RANGE

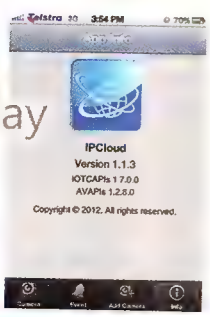
STEP 1

CONNECT WANSVIEW CAMERA TO POWER AND NETWORK

STEP 2

DOWNLOAD AND RUN THE 'IPCLOUD' APP FOR APPLE OR ANDROID

Google play



STEP 3

SCAN THE INCLUDED QR CODE, AND ENTER YOUR PASSWORD

The Wansview NCH530W is easy to setup and use for even the most novice of users. Beyond the plug and play simplicity are a wealth of features for more advanced users such as pan+tilt, wireless network, infra-red night vision, motion sensing, 2-way audio, network recording and much, much more.

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* SAC804
8+2 Port

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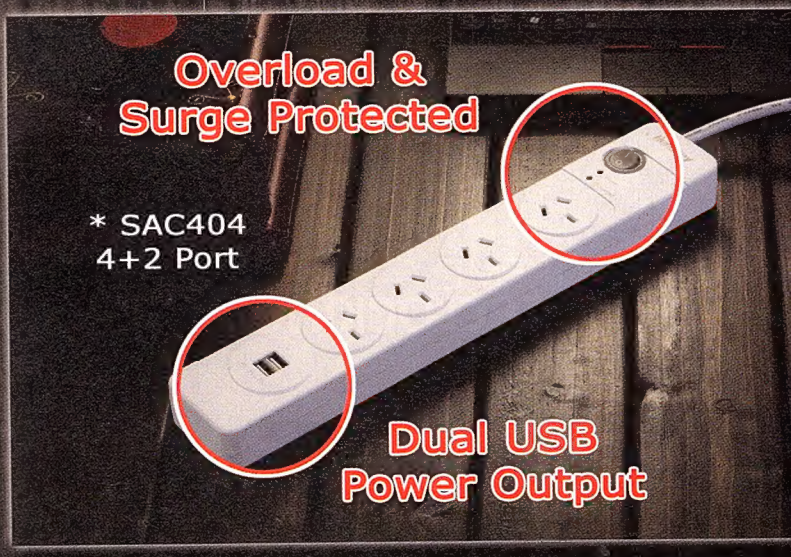
* SAC604
6+2 Port



Overload & Surge Protected

* SAC404
4+2 Port

Dual USB Power Output

* Accessories, cables, iPad and iPhone not included

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